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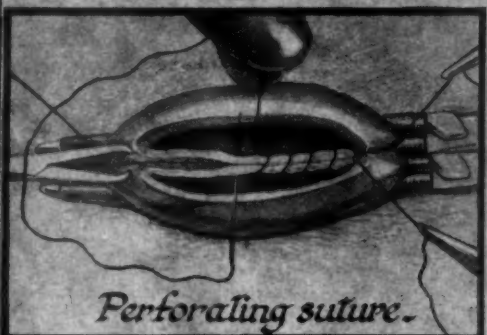
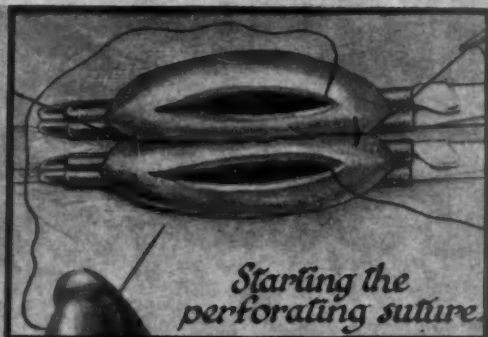
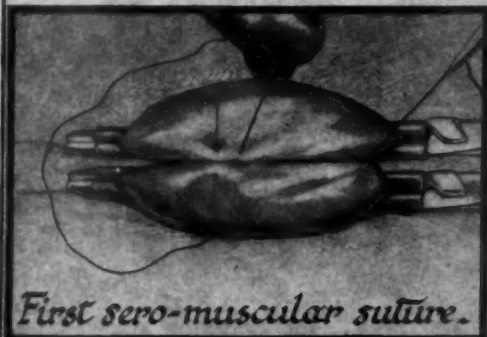
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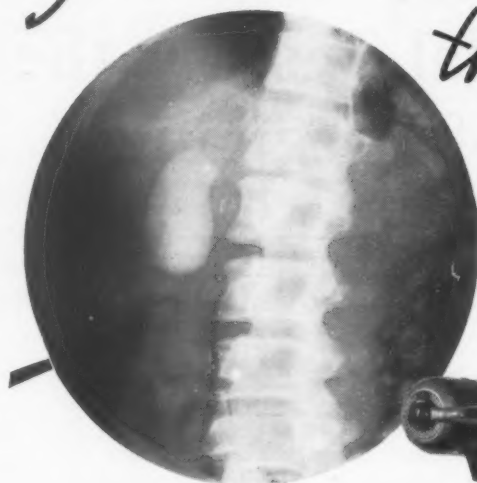
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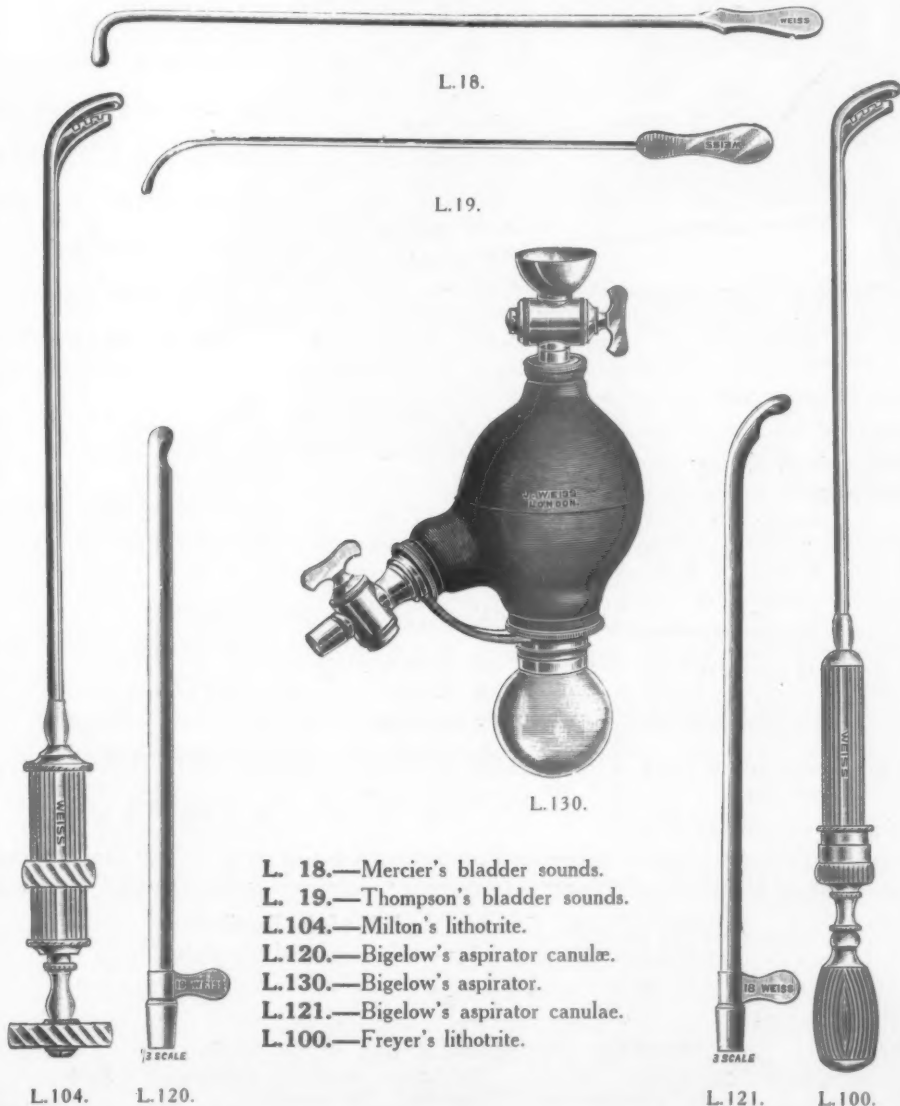
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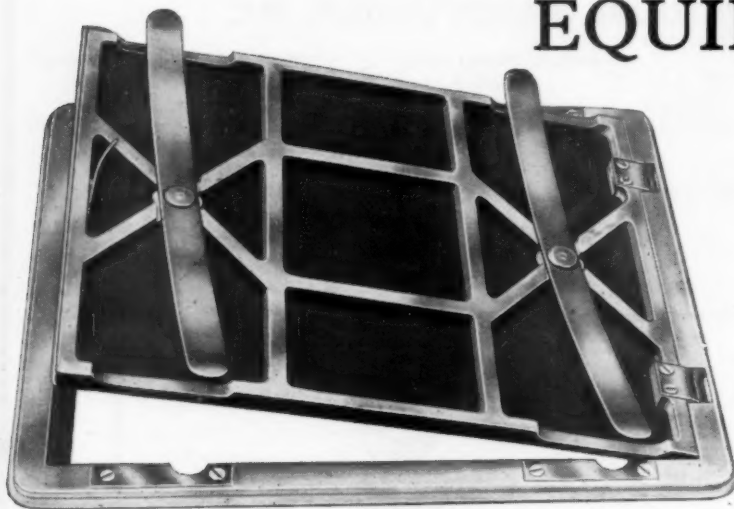
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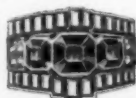
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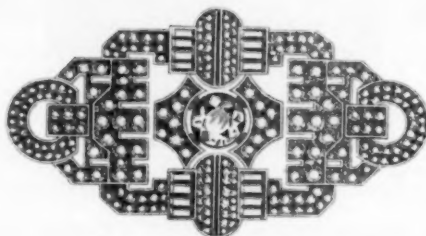
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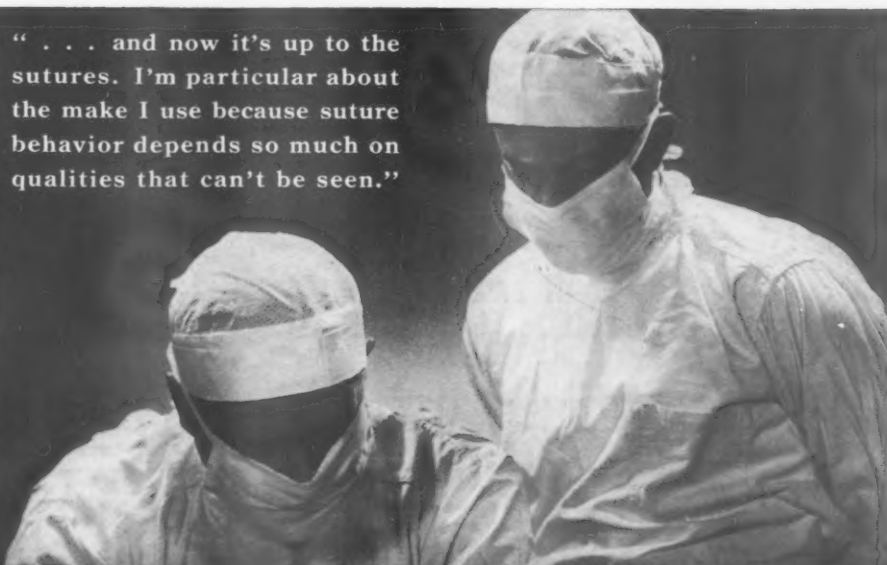
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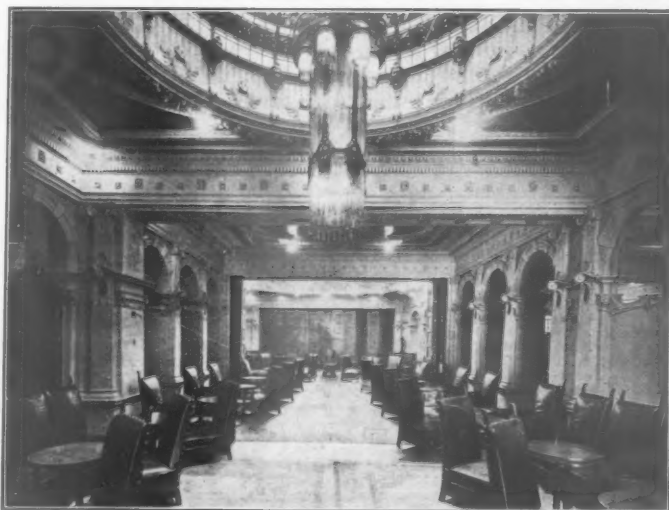


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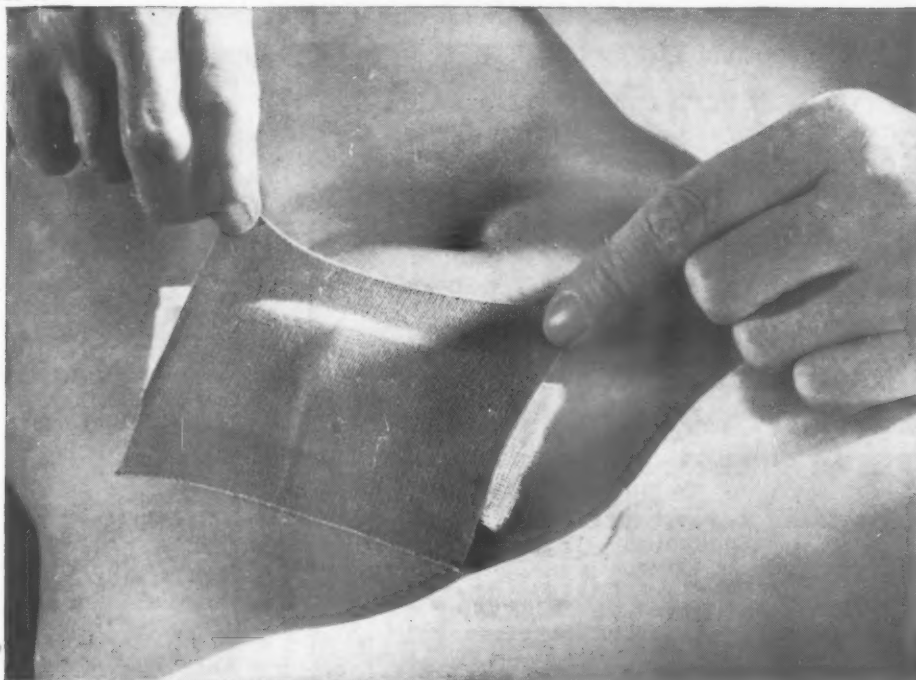
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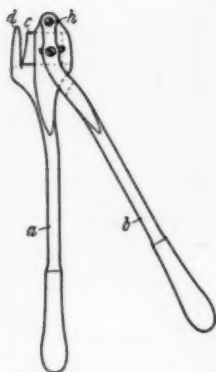
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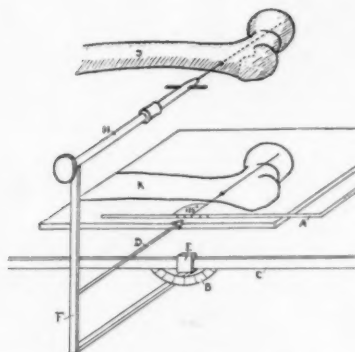
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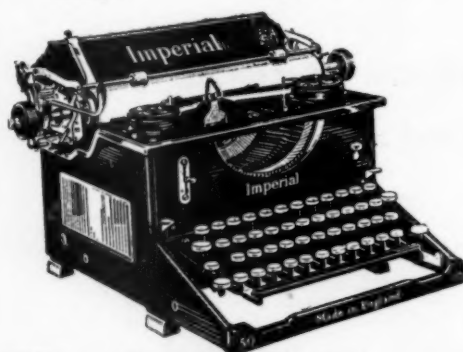
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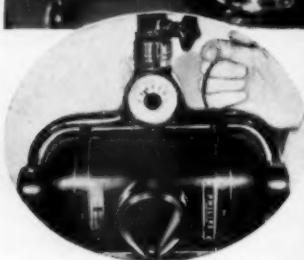
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# The Australian and New Zealand Journal of Surgery

JULY, 1937.

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## THE AUSTRALIAN AND NEW ZEALAND JOURNAL OF SURGERY

Registered at the General Post Office, Melbourne, for transmission by post as a periodical.

VOL. VII.

JULY, 1937.

No. 1.

### THE GEORGE ADLINGTON SYME ORATION.<sup>1</sup>

SOME PREVENTIVE AND RESEARCH ASPECTS OF SURGERY.

By C. E. HERCUS,  
*Otago.*

I AM very sensible of the great honour that you have done me in inviting me, a stranger within your gate, to deliver the Syme Oration. I accept this high distinction in all humility, feeling that in extending this invitation to me, a teacher of preventive medicine, you desire to emphasize the fact that Sir George Syme was not only a great surgeon, but at the same time an enthusiastic and life-long protagonist of all measures directed to the maintenance of health.

It was my good fortune to meet Syme in Cairo during the War, where, at the time, he was in charge of the surgical division of the First Australian General Hospital at Heliopolis. My friend, Sir Thomas Dunhill, introduced me as a medical officer whose principal concern at the moment was the health of troops in the field. It was not until later that I learned that as a young surgeon of twenty-nine Syme had been appointed Secretary of a Royal Commission, set up by the Victorian Government to investigate the state of sanitation in the city of Melbourne, at that time a cause of anxiety. How well the commission did its work is evident today to the most casual visitor to that beautiful and healthy city.

Throughout his professional life Syme maintained his interest in public health, and his appointment to the chairmanship of the Royal Commission of Health of the Commonwealth Government in 1924 to report on the health of Australia was a well deserved and fitting distinction. The commission's report is a document of great value and significance. It is the most important landmark in the history of

<sup>1</sup> Delivered at the tenth annual meeting of the Royal Australasian College of Surgeons, held in Auckland, January, 1937.

preventive medicine in Australia. Many of its recommendations have been adopted; but so wide and comprehensive is its scope, embracing as it does the welfare of women and children, the health of the industrial worker, public health teaching, provision and coordination of medical services, the endowment and development of medical research, that for many years it must remain the goal of the health services of the Commonwealth. A study of this document has suggested to me the subject of my address this evening, which I have entitled "Some Preventive and Research Aspects of Surgery".

As many distinguished laymen are the guests of the College this evening, I may explain that the term medicine is all-embracing. It includes both medicine and surgery, curative and preventive. This twofold purpose of medicine—prevention and cure—tends to be overlooked by the public. They regard the doctor as a healer, and consult him only when illness has overtaken them. In general, the doctor tends to accept placidly this point of view, thereby jettisoning much of the learning he has acquired during his course as an undergraduate. In our curriculum practically half the student's time is devoted to the study of the normal structure and function of the body, to the promotion and maintenance of health, to the prevention of disease, and to assisting man to live a full and healthy life. It should be the bounden duty of all members of our profession, whatever the specialty, to make full use of this learning, and to try by every means available to prevent untimely death. Ultimate death is, of course, inevitable; but the outlook of the profession should be that of the writer in Job, who looks forward to the day when every man "shall come to his grave in a full age like as a shock of corn cometh in in his season".

It is my purpose to limit my remarks to some diseases, the treatment of which falls within the scope of the surgeon rather than the physician.

Before developing this branch of my subject I should like to take this opportunity to pay a tribute to the work of this College. A perusal of your constitution and objects has suggested to me the first preventive aspect of surgery to which I would draw your attention. The first three objectives in your constitution read as follows:

- (a) To cultivate and maintain the highest principles of surgical practice and ethics;
- (b) To safeguard the welfare of the community by indicating that its Fellows have attained a high standard of surgical competency and are of high character;
- (c) To educate the public to recognize that the practice of surgery demands adequate and special training.

It is a remarkable fact that in our young democracies public opinion is slow to realize that the practice of your art is a specialty which demands a long and arduous training after graduation. In the older countries of Europe this has long been recognized. I realize that in young and sparsely populated countries like our own it is inevitable that some major surgery must be practised by the general practitioner;

but with closer settlement and improved facilities for transport it is in the interests of the public that the practice of major surgery should increasingly be confined to those who have made this subject their life work. Your College has already contributed to the education of the public in this essential matter.

Laws of supply and demand will doubtless control the number of surgical specialists in a community. There is a danger, however, particularly in a small country such as this, that too many students may elect to specialize in surgery. In the New Zealand Medical School our students early develop a strong surgical bias. Of our last thousand graduates a third have taken higher qualifications, and of these 64% are surgical.

Many factors doubtless contribute to this bias. The most important, in my opinion, are the natural initiative and resource of Dominion students, the majority of whom are essentially men of action, and the respect and admiration with which the public recognizes the dramatically successful results often achieved by surgery. You have the high privilege of restoring many people to strength and health and to the joy of living, but always in the spirit, I hope, of Ambroise Paré's oft-repeated words: "I dressed him, God cured him."

Alexis Carrell, in his remarkable book, "Man, the Unknown", summarizes the position in the following words:

Owing to the extreme ingeniousness and audacity of its methods, surgery has surpassed the most ambitious hopes of the medicine of former times. Its attainments are the purest triumph of biology. He who has completely mastered its techniques, who understands its spirit, who has acquired the knowledge of human beings and the science of their diseases, truly becomes like a god.

Can we wonder at the surgical bias, when a Nobel prizeman, himself a surgeon, can hold such allurements before our youth?

As a bacteriologist, I turn naturally from this important preventive aspect of surgery to infective conditions, the first obvious example being the prevention of sepsis. With anaesthesia and a knowledge of anatomy, this achievement stands as the tripod of the whole edifice of modern surgery.

Often has the story been told, but, as in religion so in surgery, it is good for us periodically to praise famous men. First in the field come the clinical observers. White, of Manchester, in the eighteenth century, Oliver Wendell Holmes and Semmelweis in the middle of the nineteenth century, were all convinced of the importance of infective material carried on the hands as being the cause of the most tragic of all wound infections, puerperal fever. In the absence of proof as to what constituted this infective principle, their findings failed to attract general acceptance. Indeed, they aroused in some quarters hostility. The essential link was supplied by Pasteur in 1862, when he discovered that fermentation and putrefaction were vital phenomena due to the activity of living microscopic plants. Three years elapsed before Lister's attention was drawn to this work. At once "the mind that was prepared" grasped its full implication and its relationship to wound infection. In

a series of brilliant studies which have placed his name among the immortals, Lister defined an entirely new surgical principle—the prevention of the bacteria of sepsis from entering wounds. The treatment of sepsis already established in wounds was definitely a secondary consideration. It was the first step in the evolution of aseptic surgery.

A further extension of this preventive aspect of surgery into preventive surgery itself occurred during the Great War, when, by a most fruitful collaboration between surgeons and laboratory workers, the principles of block excision of tissues, injured and devitalized by high explosive, followed by suture of the adjacent healthy tissue, was worked out. An immediate result was the reduction of the incidence of gas gangrene in from 12% of all wounds in the British Expeditionary Forces in 1914 to less than 1% in 1918. The excision of devitalized and injured tissue removed the soil on which the bacteria of gas gangrene grew and produced their poisons. This principle has been carried forward successfully into civil surgery, particularly in those counterparts of the injuries of war, accidents from motor vehicles.

This brilliant chapter in medical research illustrates the principle that in the complex field of biology the method of direct attack seldom yields results. Here we see lines of research, apparently unrelated, converging unexpectedly to supply the solution to clinical problems—the clinician observing the fluctuating incidence of puerperal fever, the chemist studying the products of fermentation pointing the way to its biological study, and this, in its turn, supplying the key to the control of sepsis. There can be no water-tight compartments in medical research.

The second example that I select is the age-old problem of tuberculosis, known to have been a slayer of man for over two thousand years. The unravelling of the aetiology of tuberculosis is a further great achievement of the nineteenth century. With the discovery of the causal organism in 1882 and its portals of entry into the body, it would have been reasonable to predict that by 1937 the disease would have been under control. Unfortunately, though there has been a steady world-wide decline in tuberculosis, the disease still kills each year some 3,000 people in Australia and 600 in New Zealand. One of the many paradoxes of preventive medicine confronts us here. The contrast with the success in the prevention of sepsis in wounds is arresting, and indicates the complexity of the problem.

It has been our custom to divide human tuberculosis clinically into surgical and non-surgical, bacteriologically into human and bovine. The steady advance of surgery into the field of medicine has robbed this clinical distinction of much of its sharpness, but has not impaired the importance of the distinction between human and bovine strains. Only by this differentiation can the relative importance of the human or the bovine reservoir in the spread of the disease be assessed. In Great Britain the bovine bacillus, received into the body by the medium of infected milk, is of great importance in the tuberculosis of bones and

joints and glands. Such evidence as we have in New Zealand on this point is insufficient to permit of any generalization. Of 78 specimens from non-pulmonary lesions typed in my laboratory, 18% were of the bovine type, which, in conjunction with other evidence, suggests that cow's milk is a relatively unimportant source of infection in New Zealand. For long the surgeon has contributed to the prevention of further extension of the disease once established in the body. Complete eradication of infection by the removal of the tuberculous focus, whether in gland or bone or skin, has sometimes been possible. The prevention and treatment of the deformities for which the tubercle bacillus is notorious are a field in which the surgeon has made great contributions. The ideal, however, must be the control of infection, and this is only in part a medical problem. This is emphasized in the Syme report. Recommendations stress the need for an improvement in the whole environment of man. Equal emphasis is placed on town planning, housing, diet measures calculated to improve man's resistance to infection, as on personal hygiene and the various well-proved measures of reducing the intensity of infection.

Further research is urgently needed in Australia and New Zealand to determine the type of bacillus responsible for the various manifestations of the disease, and the extent to which our communities have been infected with the organism, for the prevalence of infection is not measured by the number of people who are ill or who have died from the disease. In Europe immunological and *post mortem* findings show that most children are infected before reaching the age of eighteen, but that in the great majority of cases the conflict between host and parasite has been symptomless or clinically unrecognizable. Relatively only a few develop the clinical symptoms that we call tuberculosis. Such evidence as we have on this subject in New Zealand suggests that symptomless infection is less universal than in more densely populated countries. Much more work should be carried out in this field. At the same time, the nature of the relationship that exists between allergy and immunity should be further explored.

Infantile paralysis, an infectious disease of the central nervous system, has in recent months been very much before the public in New Zealand. Surgery has achieved much in the prevention and correction of the deformities which have given this disease its sinister reputation. The tremendous impetus given to orthopaedic surgery by the Great War is well known, when, under the inspiration of Robert Jones, great strides were made in the reconstruction of bones and joints in graft operations of bone and muscles, of tendons and nerve, and the prevention of deformities generally. Most effectively has this new knowledge been applied to poliomyelitis. Paralysed muscles are maintained in positions antagonistic to the common contractures. Over-action of opposing muscles is anticipated and combated. The acute stage over, function is, as far as possible, restored to the muscles by massage and muscle

training over long periods. If deformities occur, they are corrected by various surgical procedures.

Outbreaks of the disease have been one of the features of the epidemiology of this century, and a vast amount of research, clinical, epidemiological and pathological, has in consequence been concentrated upon it. The results have been substantial, and a considerable body of exact knowledge is now available. The disease is due to one of the most minute of the viruses. Elford's work indicates that its size is 8 to 12 millimicrons, only slightly larger than a protein molecule. Its principal portal of entry into the body appears to be by the respiratory route, where, in susceptible people, it enters the brain through the exposed endings of the olfactory nerve in the nasal mucous membrane. Experimental evidence from the monkey, the only laboratory animal known to be susceptible, suggests that the virus passes by the axis-cylinders of the peripheral nerves to the central nervous tissues. The principal affinity of the virus is for the anterior two-thirds of the grey matter of the cervical and lumbar enlargements, though cerebral and medullary localizations have not been uncommon in the recent epidemic in Dunedin. This striking selectivity is almost certainly to be explained on the grounds of chemical affinity between virus and motor nerve cell. The defensive mechanisms of the body, ever alert, and in this infection generally efficient, respond to the presence of the virus by the production of specific antibodies which can be recognized and titrated by neutralization experiments on monkeys. In the great majority of people this process takes place without the appearance of any typical clinical features. In towns in countries where the virus is ever present in the community, and there are few countries in the world today in which this is not the position, some 80% of people over fifteen years of age have these protective antibodies in their blood. For this reason the blood serum of normal adults is being used successfully for the transmission of an effective passive immunity to susceptibles. In a relatively small percentage of people the defensive mechanism breaks down, and the virus taking the upper hand reacts with the body to produce clinical symptoms of varying severity. Only when the infection leads to damage of the nerve cells is the disease recognized as infantile paralysis. The facts of epidemiology indicate that the innate defensive forces of the body are in the main more efficient in the child than in the adult, so that in children the interaction between the organism and the body will tend to be symptomless and inapparent, producing an active immunity which will protect the child throughout life. The paradox of the apparent increased susceptibility of children to poliomyelitis is due to the fact that in urban communities adults have acquired their immunity during childhood, and only a small proportion of the children affected show recognizable symptoms. The truth of this contention is evident when the virus first enters a community previously uninfected and where, in consequence, the adults have not acquired immunity. Such occurrences have been recorded in Nauru Island in 1910



and in the British Solomons and New Guinea in 1929, when the children were only rarely affected in a recognizable form, but a high proportion of the adult population suffered severely. Our New Zealand experience that adults in rural areas are more frequently infected than in urban areas is but another illustration of the importance of latent immunization.

Since the disease was declared to be a notifiable infectious disease in New Zealand in 1914, approximately 80% of the 3,200 notified cases have occurred in children under ten years. The New Zealand "soil" was, therefore, not virgin in 1914. Since its official recognition not a month has passed without clinically recognizable cases being notified from all parts of the Dominion. Six times the disease has assumed epidemic proportions. The explanations advanced for these outbreaks differ in no way from those advanced for similar occurrences in diphtheria, scarlet fever and cerebro-spinal meningitis, about which a considerable amount of exact data has been accumulated. The first and most obvious explanation is to ascribe epidemics to changes in the infectivity of the virus, and this is the official view taken by the health authorities in New Zealand today. Changes in host resistance may, however, explain the occurrence just as satisfactorily. This resistance factor has indeed been shown to be of primary importance in other epidemic diseases, notably in scarlet fever and diphtheria. As in all scientific disputes, the only way to determine the relative importance of the two factors is by the method of experiment. The words of the great monk, Roger Bacon, "*Sine experientia nihil sufficienter scire potest*", still apply. Unfortunately, it is impossible in man to secure suitable experimental conditions, and the experimental method has been applied to short-lived laboratory animals. Substantial contributions to epidemiological knowledge have already been made by these studies, and, though it is obvious that the findings cannot be applied in a wholesale manner to human epidemics, many of the findings appear to be applicable. No clear-cut answer has yet been given to the view that the changes in virulence are the most important factors in the production of epidemics of endemic infections.

In a recent publication Zinsser states:

Experimental epidemiology gives us little basis for assuming that enhancement of virulence is a factor of importance in the rise of an epidemic wave, or that a gradual increase of avirulent over virulent individuals in the course of the epidemic has anything to do with subsidence.

Topley and Wilson, in their recent textbook, take the opposite view. It is evident, therefore, that the present state of knowledge will not permit the importance of this factor to be accurately assessed.

The mere fact of the virus's passing rapidly from individual to individual does not necessarily involve an increase in the virulence of the organism. When once an organism is well adapted to its host, there is no experimental evidence to suggest that its infecting power is increased in virtue of rapid passage. Of the importance of host resistance in determining the occurrence of epidemics there can be no question.

Experimental epidemiology gives an unequivocal answer to the importance of this factor in the genesis of epidemics. The accumulation of susceptibles is the main factor in the periodic recurrence of epidemics in closed communities. A study of the epidemiology of poliomyelitis in New Zealand also supports the view that the host resistance factor is of prime importance. It is rare for an outbreak to recur in the same district. It is rare for outbreaks to occur in orphanages. Familial infection occurs, but is of minor importance. A virus of exalted virulence, playing a primary rôle, might be expected to infect with less discrimination than these facts indicate.

In the light of our present knowledge no dramatic or completely effective method of prevention is at our disposal. Effective control must wait until it is possible to imitate Nature's method of protection, the production of an active immunity by means of an inapparent infection. Without a doubt, active immunization will ultimately be possible, when all children might be immunized during the first year of life. School closure as a method of control of infectious diseases has been generally condemned as being of little or no value, except in rural areas, where the orbits of the children's movements touch only at the school. In an official memorandum from the Ministry of Health and Board of Education of England it is stated "that only in special and quite exceptional circumstances will it be necessary to close a school in the interest of public health". In poliomyelitis, where the battle between parasite and host is fought out, certainly in urban districts, in the pre-school period the wisdom of the measure is doubly doubtful.

The vocal element of an alarmed public opinion in New Zealand has compelled the health authorities to apply to Dunedin the principle of localizing an epidemic by isolation. Cordons have been drawn around Dunedin, and no child under sixteen years of age can leave the city unless provided with a pass from the health authorities. In a country where the disease is endemic, where the virus is carried by adults as well as by children, by the healthy more than by the sick, this measure, even if carried to the extent of prohibiting all movement of people to or from the city, is foredoomed to failure. The facts gleaned from experimental epidemiology indicate that epidemics wax and wane in closed communities as long as births occur and fresh susceptibles are thus introduced into a community. Even if it were possible to stamp out the infection from New Zealand, it would be a measure of doubtful utility unless similar measures could, at the same time, be taken in all countries. The rapidity of modern transport and the ever-increasing contact with the outside world suggest that inevitably infection would be reintroduced, when, if the disease had been absent for a sufficiently long period, a virgin soil would have developed and a widespread outbreak affecting adults more than children and associated with a high death rate would result. Meantime, preventive efforts must be directed towards the less dramatic method of letting infection come to the child in small quantities under the best possible conditions of bodily resist-

ance. This can be secured only by public education in the better control of droplets expelled from the nose and mouth, in coughing, sneezing and loud talking, in better ventilation provisions in schools, picture theatres and all places of public assembly, on closer attention to hygiene in the widest sense of the term. Research should also be instituted in New Zealand into some of the unsolved problems of poliomyelitis, with particular reference to the immunological status of selected sections of the community.

Hydatid disease is of special preventive interest to the surgeon in Australia and New Zealand. Professor Dew, in his book on hydatid disease, states that the genetic relationship between the cystic larval form and the adult worm was worked out by von Siebold in 1853. This biological discovery, made some fourteen years before Lister's publications on sepsis, would appear to have supplied the essential facts necessary for the prevention of hydatid disease. It is surprising, therefore, to find that the disease continues to take a heavy toll of human life. By 1884 Thomas, of Adelaide, recorded that in Victoria alone 500 deaths from hydatid disease occurred in the period 1868-1881. In the five-year period 1929-1935, 360 people died from hydatid disease in the Commonwealth. Sir Louis Barnett states that, during his life as a surgeon, over 3,000 people have been admitted for this cause to the public hospitals of New Zealand. Admissions to private hospitals are, unfortunately, not recorded, but some 563 New Zealanders died from hydatid disease during this period. Every year in this country some 150 people are admitted to hospital on its account.

With continued improvement in clinical diagnosis, an increasing number of cysts are detected in man before the serious complications induced by pressure or suppuration or rupture have occurred. Many of these 3,000 New Zealanders have been restored to health as a result of surgical intervention. The position is, however, most anomalous, and constitutes a grave reflection on the standard of sanitation in our respective countries. The control measures are simple, and involve no such radical alteration in our standards of hygiene as in the control of droplet-borne respiratory infections. Raw offal from sheep must not be fed to dogs. If this almost universal practice could be stopped tomorrow, hydatid disease could be eradicated from New Zealand in ten years. Thomas, writing of the Australian situation in 1884, states:

If the natural history of this parasite were generally known to the public, and if that knowledge were universally applied in the daily life of the people, in ten years time hydatid disease would be to all practical purposes extinct. Perhaps there is no other serious disease so completely within the beneficent domain of preventive medicine; but the most important advances in public hygiene must depend upon the intelligent cooperation of the individual citizen, for it is no more possible to make people healthy than it is to make them good by Acts of Parliament.

Practical experience with farmers does not inspire me with any hope in the success of voluntary measures. It would appear that in this field the imposition of restrictive measures by the Government is

not only practicable, but is urgently necessary. Shock tactics are indicated. Economic pressure alone will achieve the objective. A fine of threepence levied on every infected sheep sent to market, rigidly enforced, would disturb the prevailing apathy, and, incidentally, in the first year of its imposition would yield £50,000 in New Zealand alone. This money and all subsequent moneys collected could be devoted to hydatid research, for unsolved problems of importance, epidemiological, biological and immunological, still confront us in this field. A department of hydatid research is at work on some of these problems at present in the Otago Medical School, supported by a sum of £600 collected by Sir Louis Barnett for this purpose. Clinical problems are under investigation for fellows of this College under the direction of Sir Louis Barnett. Records of nearly a thousand cases are under analysis. This excellent work, apart from the value of the findings, will stimulate surgeons to more clinical research, to closer observation of cases and to accurate recording. The weakest link in the chain—the dog—deserves closer investigation as to whether an active immunity could not be induced artificially.

From infective conditions I turn to nutrition, a subject intimately related to infection. Intense activity characterizes this branch of medical research. Whereas the nineteenth century was the century of bacteriology, the twentieth bids fair to be the century of nutrition.

Rickets, a chronic nutritional disease of children, described first by an Englishman, Glisson, in 1650, has through the centuries exacted a terrible toll of children both in crippling and killing them. As in tuberculosis and poliomyelitis, surgery has been concerned with the prevention and correction of deformity. In this disease, however, the preventive scope is greater, as the disease, while affecting all the tissues of the body, produces its principal anatomical effects in the softening of bones and loosening of ligaments. No destruction of bone or nerve cell complicates this picture. By the control of the child's posture and movements, and the prevention of strain or weight from contact on these tissues, deformity can be entirely avoided. Where these precautions have been neglected and deformities have occurred, a surgeon can remedy many of them. Today, however, it is possible to state, with as much assurance as in hydatid disease, that rickets is preventible, even if aspects of the problem remain unsolved. Few more elusive problems can have faced the research workers. Conflicting theories of causation, all based on accurate epidemiological and clinical observations, have held the field from time to time. John Fraser, the Regius Professor of Clinical Surgery in Edinburgh, in his textbook on the surgery of childhood, written in 1926, states that the cause of rickets remains a mystery. It is evident that the solution of this problem must have been of very recent origin. The story commences in the eighteenth century with the study of gallstones. By the middle of the nineteenth century over five hundred papers had been written on the chemistry of cholesterol. In 1879, ergosterol, derived from the ergot of rye, was first described. How remote this

chemical problem would appear to be from the subject, yet in truth it was the essence of the problem, for here we have one of the parents of vitamin *D*. By the eighties of last century it had been recognized that the incidence of rickets in different countries varied directly with the sunlight, being more prevalent in winter than in summer, more common in towns than in rural areas. In consequence, it was thought that lack of fresh air and sunlight was the essential cause of the disease. Early in this century, however, it was found that the addition of cod liver oil, an old remedy for rickets, to the diet of animals was sufficient in itself to prevent rickets developing. In 1919 Mellanby produced rickets in pups by dietetic means, and showed that it was a food deficiency disease. The march of events now quickens. In 1920, English workers in Vienna demonstrated that rickets in children could be prevented in three ways: by administration of cod liver oil; by exposure to sunlight; or by the exposure of the children to the radiations of the mercury vapour lamp. Here was an apparent paradox, difficult to explain. Rickets could be cured by two such dissimilar agents as ultra-violet rays and dietary factors. The solution of this problem came from the biological chemists. In 1924 it was found that antirachitic powers could be conferred on a wide range of foodstuffs by irradiation with ultra-violet rays. This was found to be due to the conversion of certain sterols into vitamin *D*. This extraordinary discovery had actually been made by a clinician in London in 1854. In the *Proceedings of the Royal Society of London*, Thompson in that year writes an article drawing attention to the value of coconut oil in the treatment of anæmia. He claims that its action is like that of cod liver oil, whereas almond and olive oils are inactive. Nobody heeded this curious observation. No mind like Lister's was ready to receive the new thought. It was the first recognition of the activation of ergosterol with vitamin *D*. The sterols of the coconut during drying had been inactivated by the sun. In 1927 it was found that ergosterol was the substance which, under the influence of ultra-violet rays, formed vitamin *D*. By 1931 ergosterol was isolated in stable crystalline form, and is one form of pure vitamin *D*. Three variations of vitamin *D* are now recognized; a "*D*" complex has arisen. Vitamin *D* in adequate amount prevents rickets.

Bills summarizes the sources of vitamin *D* thus:

The higher animals obtain vitamin *D* in three ways, the relative importance of which must vary with habits, requirements and opportunities: (a) by eating such food as eggs, fish, whole furred or feathered animals, and insolated dead vegetable tissues; (b) by ingesting insolated sebaceous matter in the process of neatening the body—licking and preening; and (c) by directly absorbing the products of insolation formed on or in the skin. By the adoption of clothes and soap, man has limited his supplies largely to his food.

Notwithstanding this exact knowledge of causation, rickets is still widespread. In a recent study in London 87% of the children showed evidence of rickets. Minor rickets also occurs in Australia and New Zealand. Maddox, in 1932, in a convincing study on 218 unselected children at the Renwick Hospital, Sydney, found 52% with definite

evidence of rickets. This arresting finding would, on the face of it, discredit the whole theory of causation. Sydney, with its perfect harbour and climate, its two thousand hours of sunlight, its surf beaches, the envy of the world, is the last city in the world to be expected to show evidences of rickets. Disbelief increases when we find that 48% of the babies had been breast fed for at least three months prior to examination and 67% had received cod liver oil. And yet three weeks' treatment with adequate dosage of cod liver oil produced signs of healing. The anomalies tend to disappear when it is found that the feeding of the mothers was unsatisfactory, that the babies were over-clothed and confined unduly in overcrowded sunless rooms, that the cod liver oil had been below standard and had been given in inadequate dosage. The problem is simple as compared to that of tuberculosis. Though some factors in causation remain obscure, effective control is possible. Diet alone will prevent rickets. No control is required over the coughing and spitting habits of the people.

Goitre is my second example of a nutritional disease of surgical importance. New Zealand is notorious for its goitre incidence. With few exceptions, Australia is remarkably free. In this country, since 1888, over 1,500 people have died from goitre, and more than 10,000 have been admitted to our public hospitals for treatment. No data are available as to the number who have been admitted to private hospitals, but there is some evidence to suggest that if these figures were available the total would be doubled. In addition, there are hundreds of our citizens afflicted by the disease who would be the better for surgical treatment. Among the play of exogenous and endogenous circumstances in continual action on the thyroid gland an environmental deficiency of iodine is, we believe, the dominant one in this country. Geological conditions have determined a relatively low iodine content of many New Zealand soils, and in no part of our country can we regard the iodine supplied by our food as adequate. The daily excretion of iodine, the best measure of intake, even in districts with the lowest goitre incidence, is less than half that of our goitre-free dependency of Samoa. The difference is extremely minute, in the region of one hundred microgrammes. It is, none the less, of profound importance to the health of the New Zealand people. In a number of institutions in this country and in many private homes the diet has been supplemented to the extent of this hundred microgrammes with convincing results, prophylactic and therapeutic. In 1924 the New Zealand Branch of the British Medical Association, assembled in conference here in Auckland, urged the Government to make iodized salt the standard salt of the country for all domestic purposes. The Government agreed in part to this proposal, and in 1925 permitted iodized salt to be sold; labelling restrictions, however, limited its sale. By 1934, some 30% of the domestic salt consumed in this country was iodized. In the meantime, it was shown that the amount of iodine present in the salt was inadequate for the prevention of goitre. Many cases were observed when goitre developed



in spite of its regular use. Further inquiry revealed that it was only in those institutions which were using the salt for all domestic purposes, including bread and dairy products and salted food, that results were conclusive. By increasing the standard of iodine from two parts per 250,000 of salt to six parts, the hundred microgrammes were supplied and uniform results have been obtained. In the light of these facts, in 1935 the British Medical Association again urged the Government to review the whole situation and to introduce adequately iodized salt as standard salt. The position remains obscure. Ultimately, I am confident that this measure will be employed, and, with its adoption, the amount of goitre surgery will be vastly reduced and much human suffering prevented.

The Syme report devotes considerable prominence to the impact of medicine on industry. With the extension of industry which is inevitable in our respective countries, industrial hygiene must receive more attention by government, people and profession alike. The subject is not a new one. Ramazzini, Professor of Medicine in the University of Modena, in 1700 wrote a textbook on the subject, which is still a classic. He discusses how health should be maintained and disease prevented in over fifty trades. During the last hundred years Great Britain has, of necessity, paid increasing attention to the subject, until today no fewer than 1,800 doctors are in the part- or whole-time employment of the state as factory surgeons. An excellent example of the preventive aspect of medicine in action confronts us here. Industrial hygiene concerns itself with vocational guidance and with the supervision of all matters affecting the health of the worker throughout his industrial life. I have selected two examples from a wide field.

Necrosis of the jaw, known popularly as "phossy jaw", was an important industrial disease of the nineteenth century, common among match workers and requiring surgical treatment. It was discovered in 1845 that white or yellow phosphorus, entering the body through decayed teeth or through the gums, was responsible for the condition. Sixty-one years elapsed before public opinion was ready to apply the knowledge. In 1906, at Berne, an International Conference recommended all countries to prohibit the use of white phosphorus in the manufacture of matches. In consequence of this simple piece of legislation "phossy jaw" has now become of historical interest. Here we see how government action can secure an immediate brilliant and decisive result.

Industrial accidents and their prevention are the second example to which I would draw attention. Although New Zealand is not regarded as an industrial country, in the five-year period 1929 to 1933 over 30,000 people fell victims to industrial accidents of sufficient severity to be notified to the Inspector of Factories. Some 148 of them were killed. The compensation involved was over half a million pounds. It might be thought that these accidents are what we naively call "acts of God", predestined and inevitable. The activity of the Industrial Health Research Board of Great Britain has effectively dispelled any grounds

for this fatalistic attitude of mind. Great manufacturing firms, such as that of Lever Brothers, by the application of the findings of physiology, psychology and hygiene, have reduced their accident rate by over 50%. Similar results could be obtained in our own country if existing knowledge was applied. Unfortunately, we are still in what Sir Joseph Stamp describes as the period of "scientific gestation". At the moment we have no department of industrial hygiene in New Zealand and no whole-time medical officer at work on the subject.

It has been shown that but 10% of these accidents are due to causes outside the man himself, 90% being due to the human factor. The study of causation in consequence can be undertaken only by properly trained medical men, and, as in Great Britain, so in this country, general practitioners should be employed in a part-time capacity as factory surgeons, under the supervision of expert whole-time medical officers. Other preventive aspects of these industrial accidents demand attention. The sepsis rate in all industrial accidents in New Zealand has risen from 14% in 1929 to 20% in 1933. Much of this sepsis occurs in small cuts and abrasions of the hands, and it is noteworthy that 13,000 of these accidents affect wrist or hand or fingers. The great majority of these infections could probably have been largely prevented if immediate and adequate treatment had been forthcoming. Apart from the neglect of immediate first-aid treatment, do these so-called minor accidents always receive the best available treatment by fully trained and competent surgeons? Is not the name "minor surgery" a complete misnomer? Is not the minor wound, like the precancerous lesion, full of potentiality for major trouble? An injured hand frequently requires more prolonged treatment and the exercise of more judgement as to subsequent function than an inflamed appendix. Successful treatment, as in all medicine, demands also a knowledge of the man as well as of the morbid state, and in no field is psychology more important than in this. The problem of the assessment for compensation, at present based largely on speculative standards, demands that the surgeon should have an intimate knowledge of the conditions of the work of his patient. What may be an important disability in one section of industry is no disability in another. Accurate quantitative standards can replace speculative standards only by a study of industrial hygiene. Here, then, is a field of surgical preventive endeavour, full of possibilities for the future.

No address on this subject could fail to make some reference to cancer. Every civilized country continues to show increases in the cancer death rate. In 1934 in Australia 7,436 persons died from cancer and in New Zealand 1,699, the rates per ten thousand of population being substantially the same—about ten. In both countries these rates are rising, and cancer is responsible for more deaths than any disease other than diseases of the heart. It is only within the last few years that cancer has been considered a public health problem. It must be realized that the increased incidence is more apparent than real. Every improvement in public health leads to an increased cancer death rate. Every

person saved in youth from premature death becomes a potential victim to cancer. Every advance in medical diagnosis adds to the number of recorded cases; but the problem remains, nevertheless, menacing and challenging. The increasing number of people who are reaching middle age today have no better chance of life than they had two hundred years ago. Death from cancer must be regarded as an unnatural and violent death. While intense research activity into the cause of cancer is in progress the world over, the problem still evades us. Meantime, it is the surgeon and the radiologist to whom we look for help. Substantial progress has been made in this field in recent years. Some of the exciting factors of cancer are now well known and controllable. There is a substantial body of knowledge regarding the various precancerous conditions which are not yet fully appreciated and utilized by the public. In this field the British Empire Cancer Campaign is doing admirable work. One precancerous condition of special interest to us in Australia and New Zealand is skin cancer. The methods of treatment of the conditions antecedent to this form of cancer and to the treatment of the cancer itself are most efficient and reliable. The reason for this undue incidence of cancer of the skin in Australia has been ascribed to excess of the same biological rays as are responsible for the prevention of rickets. In this country two of my students, Dr. Hill and Dr. Boyd Wilson, have shown that, when due allowance is made for age and occupation, skin cancer occurs uniformly throughout New Zealand, with the exception of Hawkes Bay, where its evidence is double that of other provinces. No measurements of the intensity of the ultra-violet rays have as yet been made. Until this is done it is impossible to postulate any direct relationship between these rays and the causation of skin cancer. It is significant that outdoor workers in this country are affected with skin cancer four times more than indoor workers, and the same applies to Australia. This problem calls for further study.

Why these various predisposing causes should lead to the uncontrolled proliferation of tissue cells is unknown. Specific chemical substances have recently been shown to be able to induce the formation of cancer in normal tissues. Kennaway was awarded the Nobel Prize last year for work on this subject. The structure of various cancer-producing substances has been determined and is found to be of the same molecular architecture as that of ergosterol, the precursor of vitamin *D* and also of the sex hormones. Remarkable has been the contribution of the chemists to the unravelling of the structure of some of the most complex natural products of life. Their work is the logical extension of the work of the anatomist and the cytologist. The anatomy of the molecule has been worked out in detail for many substances which occur in, or are produced by, living cells. The skeleton of the molecule of this particular group of substances, the sterols, is a massive one, the most massive ring system with which living cells have to deal. What are the mechanisms which direct and control the normal growth of living cells in the body? Before this question is answered more insight is

required into the nature of normal growth. It is, however, significant that the same chemical substance which stimulates the ovum to grow has been shown to be closely related structurally to a carcinogenic substance. While we await the solution of the ultimate nature of the cancer process, as hewers of wood in this enterprise surgeons can, by careful collection of all relevant data relating to his cases, supply the data upon which accurate statistics can be compiled.

Much unoccupied and partially explored territory lies ahead. The situation calls for research and still more research. The type of research which I think we could explore more thoroughly is on the lines of that being done by the British Empire Cancer Campaign and the Hydatid Registry—the pooling of the results of careful clinical observations, with the closest collaboration between field, clinical and laboratory worker. Many are the channels in which we can with advantage apply this collective principle. Who can doubt the need for further study into the causes of things, when dental caries is almost universal in our midst, when in many of our secondary schools 40% of the children have excised tonsils, when the incidence of gastric and duodenal ulcer, of gall-stones and appendicitis excites the comment of all visiting surgeons, when purgative pills continue to build castles for their proprietors, when crippling conditions of the joint abound and knowledge of causation is little in advance of what Hippocrates knew?

Thanks to the generosity of public-spirited citizens in Adelaide, Melbourne and Sydney, Australia is already provided with excellent medical research institutions.

The Syme report, while acknowledging the value of the existing provision, points out the need for the better organization and more liberal support of medical research in Australia. The establishment of a Health Research Council is recommended, and an appropriation by the Commonwealth Government of £30,000 *per annum* for health research. After eleven years this seed has germinated, and in February of this year the first meeting of the National Health and Medical Research Council will be held in Hobart. A government grant of £20,000 *per annum* has also been made.

In New Zealand we have as yet no medical research council, no medical research institute, no annual government endowment. It is true that we have several endowments from private benefactors and from the British Empire Cancer Campaign, but none is adequate.

In striking contrast is the amount of attention which has been paid to industrial and agricultural research. There is a central research organization, the Department of Scientific and Industrial Research, with a permanent secretary. Through advisory committees this department controls a Dairy Research Institute, a Plant Research Bureau, a Wheat Research Institute, Leather and Fruit Research Laboratories. There is also the Cawthron Institute established by the late Thomas Cawthron for agricultural research. Research activities are also undertaken by the various branches of the Department of Agriculture and by the Canter-

bury and Massey Agricultural Colleges. Over £40,000 *per annum* are spent in New Zealand on these research activities.

The position is anomalous. Organized research into the causes of the diseases of man has had to give precedence to problems confronting agriculture and industry. The position is still more anomalous when the large sums expended on hospital construction are considered. There is a lack of balance in the whole situation.

The first requirement is the setting up of a medical research council similar to the one recently formed in Australia, and the provision of a fund in aid of research into health questions. This council would control and coordinate all epidemiological, clinical and laboratory research on medical and dental problems. The establishment of an institute of medical research where fundamental problems can be investigated is essential. Such an institute would require to be staffed by a team of carefully selected and thoroughly trained men of special ability. They must be given remuneration sufficiently adequate to ensure continuity of service and regular visits to other centres of research. They must be free from political interference and from demands for quick returns. Improved facilities for public education in health are required also, for the application of existing knowledge would lead to a substantial reduction in ill-health. Immense opportunities for the application and extension of preventive medicine lie ahead.

In conclusion, I would again acknowledge the work which your College is doing in the promotion of an informed public opinion with regard to surgery, in improving the standards of surgical practice and ethics, in the furtherance of preventive and research work. In facing the future may we ever keep before us the Greek ideal of hygiene, not simply health for health's sake, but health of mind and body for the purpose of producing happy, self-reliant, well-balanced citizens of good-will, balanced physically, mentally and spiritually, for there can be no greater need in this unbalanced age in which we live than citizens conforming to Juvenal's classic phrase, "*Mens sana in corpore sano*".

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## THE CEREBRO-SPINAL FLUID IN RELATION TO NEURO-SURGERY.<sup>1</sup>

By LEONARD C. E. LINDON,  
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IN our generation, surely no single man has contributed so much to the progress of neuro-surgery as Professor Harvey Cushing, particularly if we include in that contribution, as I think we must, the principles and the spirit of research with which he inspired those men who have worked as his assistants, and who are now scattered widely in many countries of the northern hemisphere. If I were asked to select the most notable aspect of his work, I think I should choose the manner in which he analysed the failures and complications that attended his earlier efforts. He brought to the problems the mind of a highly trained pathologist and research worker, he sorted out each cause of failure and devised additions and alterations in technique which avoided these complications, until finally, when he retired from active practice, he had a record of achievement that can seldom have been approached. He was, above all things, pathologist first, a surgeon afterwards. In making this statement, one is not under-estimating the part played by British neurologists; Cushing himself was always first to acknowledge the debt which he owed to them, particularly to Horsley.

It is frequently said that our failures teach us more than our successes. I should prefer to say that in neuro-surgery our failures may teach us little and slowly, but they do at least give us furiously to think. And I have chosen this subject because it is one which plays a large part in our failures, and which has given much food for thought.

In the last six years I have undertaken the management of 103 cases of intracranial tumour or cyst, of which 86% showed evidence of increased intracranial tension, either by the presence of choked disks, or by measurement of the cerebro-spinal fluid pressure. And much of this paper is based on problems which have arisen from those cases. I have completely avoided the question of spinal cord tumour; that in itself would occupy the time at my disposal.

I can do no more than to relate a few of my experiences, particularly my failures and perplexities. I cannot hope to present anything original; but they are matters of great interest to me, and I can only hope to transmit some of that interest to you, even to those of you whose lines are cast in more optimistic fields of surgery.

<sup>1</sup> Read at a meeting of the Victorian Fellows of the Royal Australasian College of Surgeons on August 22, 1936.



One's efforts are handicapped by the lack of a well-trained pathologist. One needs the constant stimulus and inhibiting influence of a pathologist's criticism.

The title given is somewhat misleading, but was chosen for its relative brevity; for much of this paper bears upon the behaviour of the cerebral tissue fluid; in fact, it is a more potent factor in causing death than is the cerebro-spinal fluid itself. Therefore, to be more accurate, this discussion should be entitled: "The Relation of Neuro-Surgery of the Intracranial Fluids, other than Blood."

I think this is a subject of great importance, and it appeals to me on two grounds. In the first place the vast majority of symptoms and signs in neuro-surgery are due, not to destruction of nerve cells or fibres, but to hydrostatic alterations in these two fluids, the tissue fluid and the cerebro-spinal fluid, alterations which result in temporary loss of function of the affected area of the brain. What is most confusing, these alterations may cause loss of function of remote areas of the brain, producing a most involved and incongruous symptomatology. In the second place, and of more grim importance, is the fact that death is the result of failure to bring under control these hydrostatic changes. On occasions, a tumour of high or low malignancy kills by virtue of its situation in a vital spot, from which removal would be as fatal as the existence of the tumour. How very much more frequently do we find a patient in hopeless condition, with only a small, peripherally situated tumour, but with the most intense and widespread oedema.

The swelling and pressure of cerebral oedema give rise to anoxæmia of nerve cells and fibres, and if we can only bring these hydrostatic changes under control, the capacity for recovery shown by the fibre tracts is very great.

How great is this capacity for recovery may be gathered from the following case, which illustrates the degree of recovery which may result after the removal of a large but slowly growing tumour.

CASE I. S.F.P., aged sixty-two years, had suffered for nearly three years from what were believed to be the effects of a cerebral hæmorrhage; the history of the case began with an instantaneous collapse with unconsciousness, followed by left-sided hemiplegia, from which a slow recovery was made. The patient was seen in June, 1931, with the history that the hemiplegia had returned during the last sixteen months, and for the last six months he had been bed-ridden; he had been incontinent for three months, and blind in both eyes for the last four months. In a two-stage operation a right parasagittal meningioma measuring 7 by 9 centimetres was removed. The patient remained blind, but recovered the use of arm and leg to an amazing degree, was capable of walking miles a day, and supervised the working of his farm until he died of pneumonia three years after his operation.

As another instance, one might quote the rapid recovery of vision in chiasmal lesions, providing the condition has not progressed to actual atrophy of the fibres of the optic nerve. To quote Cushing ("Cameron Lectures", Edinburgh, 1925):

The success or failure of many of his [the neuro-surgeon's] undertakings depends more on his familiarity with the fluid circulation and its possibilities

as a complicating factor in his procedures than upon any other one thing. For the fluid, indeed, may prove his most stubborn enemy or his most valued ally.

The subject will be discussed under the following headings: (i) Physiology. (ii) Headache. (iii) Cerebral trauma (accidental). (iv) Cerebral oedema. (v) Hydrocephalus (acquired). (vi) Cerebro-spinal fluid in diagnosis (abnormal circulation).

#### PHYSIOLOGY.

The story of the researches into what Cushing has described as the "third circulation" makes intensely interesting reading, and when described by him is sheer entertainment. And it is mainly to him, and to those who worked with and under him, that credit is due for what little is yet known with certainty. About fifteen years ago one gained the impression that the details of the production and circulation of the cerebro-spinal fluid were established and settled to the satisfaction of all. But so great has been the increase in research into clinical neurology that few of the older theories have withstood the criticism of the clinical investigators.

One gains the impression that the following views are accepted as regards the mere circulation of the fluid.

#### *Site of Production.*

Production takes place at the chorioid plexuses, chiefly those in the lateral ventricles. But it is held by some that under conditions the cortex contributes to its production by way of the perivascular channels, and I think I have two cases which support that view.

CASE II. Mrs. S., aged forty-six years, was found to have an enormous meningioma *en plaque* in the left temporal region, arising from the dura by a circular base, having an area of 9 by 9 centimetres. Owing to loss of consciousness due to rapidly increasing intracranial pressure, it became necessary to sacrifice the bone from the flap. Subsequently the patient was treated by X ray therapy. Eighteen months later, owing to the persistent bulging of the decompression and the feeling of induration after aspiration of the flap, a recurrence was suspected and the flap was reopened. It was found that the bulge was entirely due to a collection of fluid in a cavity which was entirely shut off from the subarachnoid space and whose inner wall was formed by the cortex of the brain; there was no sign of recurrence. This cystic swelling has frequently been aspirated, with the recovery of fluid which is indistinguishable from cerebro-spinal fluid.

Knowing that the subarachnoid space was entirely shut off, it seems to me that the inference that can be drawn is that this cerebro-spinal fluid is being produced by the cortex forming the inner wall of the cavity.

CASE III. Baby McC., aged nine months, suffering from hydrocephalus, was being investigated by means of encephalography, during which process 70 cubic centimetres of fluid were removed from the lumbar subarachnoid space. It was subsequently found at operation that there was complete occlusion of the foramina of exit from the fourth ventricle, with gross internal hydrocephalus, and autopsy confirmed the statement that there was no communication between the ventricular system and the subarachnoid space.

The question arises, whence all the fluid removed from his subarachnoid space came (the passage of air up to the vertex proved the

continuity between the intracranial and spinal subarachnoid spaces). It seems to me that the conclusion can only be that fluid was being secreted or produced from the cortex of the brain.

#### *Absorption.*

It is considered that absorption takes place through the arachnoid villi projecting into the various dural venous sinuses. It is believed that by this route about five-sixths of the fluids are absorbed, the remainder being absorbed by veins down the course of the spinal canal. Finally, under certain conditions, it is known that the cortex itself can absorb fluid, again probably by the perivascular spaces.

The chorioid plexus appears to be capable of practically no absorption, and the ependymal lining of the ventricles acts as an effective barrier against the passage of fluid, even when the intraventricular pressure is very high.

It has frequently been observed that air or oxygen introduced into the ventricles during the performance of ventriculography is absorbed very slowly, having been found present in one case of mine as long as seven days after its introduction.

#### *Mode of Production.*

For some time it was held that the production was a filtration process, dependent upon the capillary pressure in the chorioid plexus, whereby the constituents of the plasma, less the protein elements, were filtered through to form the cerebro-spinal fluid. And also that absorption was a purely physical process dependent upon the difference between the relative pressures of the cerebro-spinal fluid and the venous blood of the superior longitudinal sinus. But this theory has never quite filled the bill.

1. There is considerable evidence of a selective action of the part of the cells of the plexuses. It is stated that bile salts and pigment have never been found in the cerebro-spinal fluid, even in the most intense cases of obstructive jaundice. In diabetic patients the sugar content of the fluid does not keep pace with the rise in blood sugar. And practically all the attempts to influence diseases of the central nervous system by intravenous administration of drugs, particularly the heavy metals, have been failures. It is doubtful whether hexamine will pass the chorioid plexus, except when given in dangerously large doses. Hence the endeavour to treat meningitis by the subarachnoid injection of hexamine. And it is also possible that the Pacchionian villi exert a selective action in the passage of the fluid back into the longitudinal sinus.

2. Flexner has shown, by thermo-dynamic tests, that work is actually done by the cells of the plexus in the production of cerebro-spinal fluid.

3. The experiments of Bedford (*Brain*, Volume lviii, 1935) indicate that increase of torcular venous pressure to many times above normal

is not accompanied by more than a transient rise of cerebro-spinal fluid pressure. This is certainly contrary to what one would expect if the production of cerebro-spinal fluid were dependent on a process of infiltration.

#### *Quantity and Rate of Production.*

Undoubtedly there may be flaws in the evidence just quoted. And I think that one of the chief reasons why we are still so much in the dark is that so many conclusions are drawn from experiments performed under abnormal conditions. We have as yet very little certain knowledge of the behaviour of the cerebro-spinal fluid in the normal person. And this applies particularly to the quantity and rate of production.

Cerebro-spinal fluid may run freely from a fistula; a patient with glioma of the optic chiasm developed a cerebro-spinal rhinorrhœa and drained fluid at the rate of two cubic centimetres in five minutes, perhaps 500 cubic centimetres in a day.

Again, when the ventricular system is tapped in a case of obstructive hydrocephalus, it refills again very rapidly. And in the continuous forced drainage used in the treatment of meningitis quantities up to three litres may be produced in a day.

But these are all abnormal conditions. Weed, Flexner and Rand have

produced evidence to support the view that in the normal closed condition the daily exchange of fluid may be limited to but a few cubic centimetres. Rand believes that a moderately severe head injury may be followed by complete cessation of production of fluid, and thus he explains the persistently low cerebro-spinal fluid pressure which frequently follows such injuries.

#### *The Obstructed Ventricle.*

It is interesting to observe the effects of ventricular obstruction. A relatively rare type of tumour, generally benign, is the true intra-ventricular tumour; it generally arises in association with the chorioid plexus, and produces a ball-valve effect, though eventually it gives rise to complete obstruction (Figure I).

In keeping with the effects of intermittent obstruction in other hollow organs, the ventricle becomes greatly dilated behind the obstructing tumour. This is a slow process, as evidenced by the fact that the fibres of the pyramidal and other tracts are capable of accommodating themselves to the process of stretching which occurs, without interference with their function until an advanced degree of hydrocephalus has

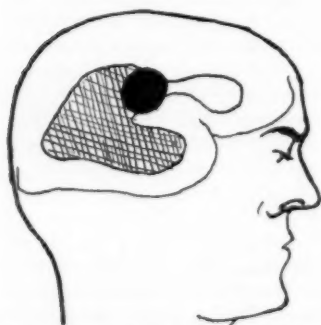


FIGURE I. Ball valve tumour (after Dandy), showing dilatation of the ventricle behind the obstruction.

resulted. But in spite of this raised intraventricular pressure, the plexus obviously continues to secrete fluid.

Much more difficult to explain, however, are the behaviour of the ventricles and their radiographic appearances when a tumour of brain substance has gradually encroached upon a ventricle, first deforming it and finally causing complete obstruction. Admittedly this is probably a more rapid process than occurs in the case of the ball valve tumour, but the following case raised extremely interesting points in interpretation.

CASE IV. Miss W., aged thirty-five years, was seen in May, 1936, with the history of headaches during the previous three months. The headaches were sudden in onset, were localized to the right frontal region, and, although extremely severe, lasted only a few minutes. They were accompanied by a feeling of numbness and loss of use in the left leg. There had been no vomiting, and she felt perfectly

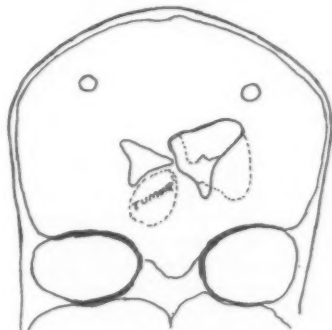


FIGURE II. Case IV. Miss W., showing collapse of the obstructed ventricle and hydrocephalus of the opposite ventricle.

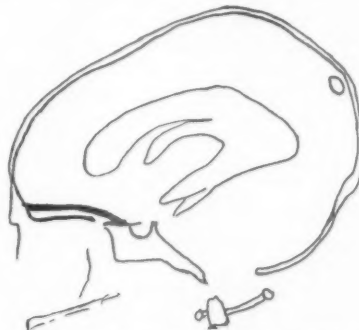


FIGURE III. Case IV. Miss W., showing absence of shadow of one anterior horn.

well between the attacks; but the headaches were becoming more frequent, and examination revealed a rapidly growing bilateral papilloedema with hæmorrhages. Otherwise neurological examination revealed no abnormality, and the cerebro-spinal fluid was normal apart from its increased pressure.

The brief but severe paroxysmal attacks suggested the presence of a ball valve tumour in the right lateral ventricle. But this diagnosis was disproved by ventriculography.

The right ventricle was tapped first and yielded only 15 cubic centimetres of fluid under tension, which was replaced by air; the skiagram showed that the air was limited to the hinder end of the ventricle and the temporal horn, the anterior half of the ventricle being entirely absent from the picture, and no air had passed into the third ventricle. The left ventricle was then tapped, and 40 cubic centimetres of fluid were replaced by air. The skiagrams (Figures II and III) showed a moderate degree of dilatation of the ventricle on the side opposite the lesion. At operation, after the collapsed anterior horn of the right ventricle was opened, a fibrillary astrocytoma was found at a depth of six centimetres. The tumour was arising in brain tissue in the medial wall of the anterior horn and was pushing laterally and backwards into the ventricle and occluding the foramen of Monro. After piecemeal removal of the tumour, the foramen allowed fluid to gush through from the third ventricle. It is extremely difficult to account for the production of these paroxysmal attacks by such a tumour, and extremely

difficult to account for the cessation of secretion on the one side and progressing hydrocephalus on the other. A course of X ray therapy was administered after recovery from the operation, and the patient returned to her work as a typist ten weeks after operation.

#### *Pressure and Posture.*

The limits of accepted normal pressure are wide, being from 90 to 140 millimetres of water with the subject in the horizontal position. If the patient is sitting upright, the pressure measured by lumbar puncture may normally rise to 200 or 250 millimetres. But this will be far short of the pressure of a column of fluid extending from the

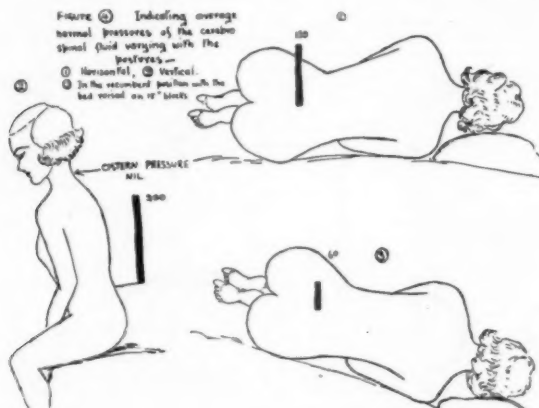


FIGURE IV.

calvarium to the lumbar region. In cisternal puncture in the sitting position, the cisternal pressure is so low that the cerebro-spinal fluid must be aspirated. In fact, with the subject in the upright position the intracranial pressure may be as much as 100 millimetres less than when he is lying horizontally.

Raising the foot of the bed onto eighteen-inch blocks will raise cisternal pressure (and therefore conceivably the whole intracranial tension) by as much as 60 millimetres (Figure IV).

I have had no opportunity of measuring intraventricular pressure in a normal person in the erect position. But at the level of the *cisterna magna* it is not great enough to force the fluid through a fine bore needle, so it is probably very low. In the same position, the torcular venous pressure must also be very low or negative; and it gives rise to the speculation as to whether any cerebro-spinal fluid is absorbed when the body is erect.

The variation of pressure with posture has been made use of by de Martel, who introduced the upright position in intracranial



operations, a position which is not altogether without its risks, such as circulatory collapse.

It was pointed out by Forbes and Wolff some years ago that after the first hour or two of sleep the intracranial pressure began to rise; it is interesting to associate this fact with the clinical finding that the headache of increased intracranial tension frequently wakes the patients early in the morning, as, for instance, the morning headache of the patient with a cerebellar tumour.

#### *Tissue Fluid.*

Textbooks dismiss tissue fluid briefly, as being a fluid of which little is known, its composition closely resembling plasma, but with practically no protein content; in other words, it is held to bear very close relation to cerebro-spinal fluid. It is stated that its behaviour is similar to that of the tissue fluid of other organs, and depends upon the same factors, for example, the state of tissue activity. But I cannot help feeling, though without any proof, that there is more to it than that. There is no doubt that there is no movement either way of fluid between brain tissue and ventricle, except perhaps under a condition of extreme internal hydrocephalus. But what of movement to and fro between brain tissue and subarachnoid space by way of the perivascular channels? I cannot find any statements of value about it in the literature.

We know that the cortex can under normal pressure conditions exude a fluid indistinguishable from cerebro-spinal fluid. Again, consider a subtemporal decompression performed to relieve a condition of greatly increased intracranial pressure. As soon as the dura is widely opened, brain at once becomes impacted into the dural gap, and prevents the further escape of cerebro-spinal fluid. But, nevertheless, there may be a profuse outpouring of fluid from the surface of the impacted brain, which may cause oedema of scalp and temporal muscle and even neck, and this may continue for some days until adequate relief has been given to the intracranial pressure. Whence comes this fluid? It certainly cannot come from the subarachnoid space, as that is tightly shut off by the impacted brain. I believe it escapes from the exposed area of cortex, and its flow is more profuse if the *pia mater* is lacerated. I think that this is probably cerebro-spinal fluid which has escaped by way of the cerebral tissue circulation. And if this ebb and flow between subarachnoid fluid and fluid within brain tissue can occur in certain conditions, surely it is possible that this is a part of the normal circulation of the cerebro-spinal fluid. And the circulation may itself be capable of varying with changing daily conditions.

As regards the action of hypotonic intravenous injections in the reduction of intracranial pressure, I cannot believe that it acts by increasing the absorption of cerebro-spinal fluid into the venous sinuses by osmosis, as is stated by many. One has only to make use of this method when a bulging brain has been exposed after incision of the dura, to notice the obvious shrinking of the convolutions and lobes

themselves to such an extent that the brain may fall well away from dura and bone. The increased osmotic pressure has drawn tissue fluid from the brain tissue back into capillary circulation, and literally has dehydrated the brain.

This is a process demanding a normal capillary circulation, a circulation that is markedly depressed in surgical shock; hence the uselessness of dehydration treatment early in cases of head injury, or after intracranial operations performed under ether anaesthesia.

#### HEADACHES.

While investigating cases of post-traumatic epilepsy and headache, some interesting observations were made with regard to the relationship between various types of headache and the site of intracranial pressure.

The headache associated with very rapid increase of intracranial tension is generally very severe, for example, in meningitis, acute abscess and acute oedema of the brain.

The headache associated with very gradual increase of intracranial tension, such as is found with the majority of cerebral tumours, is nearly always mild in degree, and, although persistent, does not prevent the patient from following his occupation until late in his illness.

The agonizing headache complained of by the patient who has recently been the victim of a mild degree of head injury, and which he describes as being sufficient to prostrate him, together with other symptoms, commonly grouped as traumatic neurosis, is found almost invariably to be associated with a grossly subnormal cerebro-spinal fluid pressure, something well below 75 millimetres of water; the lowest I have recorded was a pressure of 10 millimetres in an hysterical patient. The constancy of these low findings is very striking, and just as impressive is the benefit obtained by these patients when the intracranial tension is raised by postural treatment by elevating the foot of the patient's bed upon eighteen-inch blocks. As soon as any such patient commences to complain of this type of headache following trauma, his cerebro-spinal fluid pressure should be measured, and, if it is low, he should be treated by postural treatment. Such a headache can be relieved temporarily by the intravenous injection of hypotonic solution, but obviously this cannot be continued for long, and the postural treatment is a much more satisfactory method of raising intracranial pressure.

It is interesting to speculate on the relationship between low intracranial tension and the production of headache. Obviously there must be a multitude of different underlying causes for the various types of headaches from which patients suffer. But those who suffer from the headache of neurosis form quite a large group, and the one common factor seems to be this low pressure.

In a recent article by Penfield, he publishes some of his observations upon the nature of headaches as felt by patients undergoing craniotomy under local anaesthesia. He confirms the fact that the dura is insensitive, except in the neighbourhood of the branches of the meningeal arteries;

but he also shows conclusively that the dural sinuses are the really sensitive part of the intracranial contents, and he has found that pressure or tension upon these sinuses is a more fruitful stimulus of pain than cutting or pinching.

The patient whose cerebro-spinal fluid pressure in the horizontal position is only about 60 millimetres would in the erect position probably have an extremely low intracranial tension. And it may be that this extremely low or negative intracranial tension exerts a pull upon these sensitive dural sinuses, thus giving rise to severe headache. Another very interesting observation follows from Penfield's article. Over a series he has charted the site to which pain was referred on stimulating the various sinuses; and one notices that the majority of patients referred their pain either to the region of the eye or to the temple of the same side irrespective of the site of application of the stimulus. This explains why headache *per se* is of such little value in the localization of brain tumour (Figure V).

#### BRAIN TRAUMA.

So far, we have considered matters which, while of considerable academic interest, are not of vital importance to the patient. But it is in the swelling of brain trauma, whether accidental or operative, and in the swelling of brain neoplasm, that the life of the patients turns upon the behaviour of these circulating fluids. Head injury is becoming a popular subject amongst surgical authors, and most recent articles emphasize the tendency towards conservative and expectant treatment. From the point of view of immediate hospital treatment, cases of brain trauma (excluding lesions of scalp and bone) group themselves as follows: (i) cases rapidly fatal, (ii) cases with rapid recovery of function, (iii) cases showing evidence of localized progressive involvement of the brain, (iv) cases showing evidence of general progressive involvement of the brain, (v) cases of prolonged stupor.

The treatment of the first three groups requires little comment from me. But the fourth group is not uncommon. There is generally evidence of a severe cranial injury; usually a fracture of the base of the skull, with its attendant shock. The patient is unconscious and we lose the diagnostic assistance of the lucid interval, but neurological examination

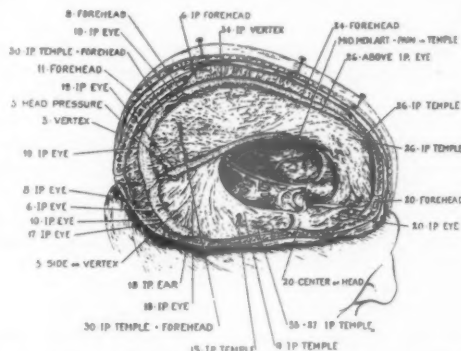


FIGURE V. (After Penfield.) Indicating the situations to which pain is referred on stimulation of various dural sinuses.

shows no evidence of an intracranial hæmorrhage, and the pupils are small and react briskly to light. There is no asymmetry in the tone and reflexes of the limbs, nor is there any to be found during the remainder of life. The patient recovers from circulatory shock, responds to painful stimuli, and passes into irritable stupor. This is a dangerous condition, though a house surgeon is prone to regard it as satisfactory, and is apt to relax his attention under pressure of other work. This patient is suffering from general œdema of the brain. He does not get the dramatic pulse and respiration drop, with stertorous breathing, seen in clot compression, which would be recognized at once. His pulse rate remains steady in the sixties. If he is lucky, his œdema ceases to spread, and gradual recovery takes place. On the other hand, if the œdema should continue, one of two things will happen. He will gradually sink deeper and deeper into stupor, still with steady pulse rate and small active pupils, till the crash comes. Or he may develop intense irritability and restlessness, amounting almost to mania, and this apart from any external stimulus. Then, too, the crash comes, the signs of medullary failure and imminent death. The coma deepens, the restlessness ceases, the pulse rapidly rises, the pupils are still symmetrical, but are becoming large and inactive, and death by respiratory failure soon follows.

CASE V. Miss B.E., aged fifteen years, was knocked down in the street and was admitted to hospital unconscious, but moving her head and restless. Her pulse rate was 64. The pupils were small, equal and active, and tendon reflexes were not elicited. Her condition remained almost exactly the same for the next thirty hours. During all this time her pulse rate remained in the region of 80 to 84. Her pupillary reactions remained normal, she was still in deep stupor, but the outstanding feature of her condition was the pronounced restlessness.

Thirty-one hours after her admission it was reported to me that her stupor had become deeper and that she was quite quiet. She still responded to painful stimuli. Her pulse was 70 and her pupils were still equal and reacted briskly. I considered that she required a liberal decompression.

While she was being prepared for operation a dramatic change was noted in her condition. She became more deeply unconscious. There was no response to painful stimuli. The pulse remained at 70, but her breathing became stertorous and her pupils both began to dilate symmetrically and ceased to react to light. Within half an hour, just before operation, breathing ceased. Artificial respiration by administration of oxygen through an endotracheal catheter was carried out, and decompression was commenced, but the heart finally ceased beating during the removal of bone.

This patient throughout her stay in hospital gave no evidence of localized intracranial pressure, nor did she show the classical signs associated with a steadily increasing intracranial tension until just before her death. But had one but realized it, her pronounced and constant restlessness was sufficient indication of acute progressing cerebral œdema.

Could this state have been predicted? (These patients often live up to forty-eight hours before the final crash comes.) Yes—at least it could have been suspected with enough certainty to indicate that the general œdema had reached grave proportions. Two examinations would have given vital information: the repeated blood pressure record, and at least

two readings of the cerebro-spinal fluid pressure. I am entirely opposed to immediate lumbar puncture in these cases; but after twenty-four hours lumbar puncture for monometry is safe and may be of the utmost value.

What can be done for these patients? I was most impressed by an address given by Norman Dott last year in Edinburgh, when he emphasized the urgency of these cases. Those of you who have done an occasional subtemporal decompression on these patients will remember the appalling tension of the *dura mater*, and you will remember arriving at the conclusion that nothing short of an autopsy flap would adequately relieve such tension. The later the case, the greater the tension, and therefore the less is the likelihood that a Lambert Rogers medullary decompression can do any good.

Dott takes a much more active hand in treatment. If one is able to watch all patients with severe head injuries closely oneself, one should be able to realize, at the end of twenty-four to thirty-six hours, that the patient has a progressive cerebral oedema. That means that the odds against spontaneous recovery are great. And Dott performs a huge osteoplastic decompression, frequently on both sides, and claims considerable success. It is always possible that in the successful cases the patients might have recovered in any case. But on the law of averages they would not have done so; and the physiological essence of the treatment is that a big decompression must be done early, before the oedema has spread to the contents of the posterior fossa.

Attempted decompression by lumbar puncture, apart from being hopelessly inadequate, will probably kill the patients by hastening medullary impaction. Ventricular tap is also useless, as the ventricles are small and collapsed. The tension is entirely due to swelling of brain substance and not to hydrocephalus.

We have to remember the extreme vulnerability of the cells of the medullary centres, particularly those of the respiratory centres. It is stated that they will not recover from five minutes of anoxæmia. In six cases we have kept the heart beating regularly for from three to seven hours after respiration has ceased, by forced ventilation through an intratracheal catheter—all to no purpose ultimately. Two of these were patients with tumour whose medullas actually became impacted on the days appointed for their operation. The remainder followed head injury. Beware of the patient with tumour whose pulse and blood pressure have been behaving erratically for some days prior to operation. That patient stands on the brink of disaster.

#### *Cases of Prolonged Stupor.*

Finally, there is the patient who recovers to a level of semi-consciousness, who will give an answer of sorts to persistent questioning, but who then fails to make progress. There is evidence of some macroscopic contusion of brain tissue and yellow cerebro-spinal fluid, and the pressure of the fluid is raised, often over 200 millimetres. (Some of these patients will not have a raised pressure. Obviously, then, no

question of decompressive measures will arise.) But if the pressure is still markedly raised after seven days, what is the wisest treatment? Undoubtedly, in most of them the pressure will gradually subside, specially with repeated lumbar punctures.

But in these cases we are not so much worried by fear of death (for the patients nearly always survive) as by fear of imperfect recovery of cerebral function. There is no doubt that the presence of cerebral œdema will retard the absorption and removal of products of disintegration of brain tissue, and it is stated that this prolonged state of œdema by increasing anoxæmia is a prelude to the softening and cystic degeneration found later in frontal and temporal lobes of these patients. It has also been advocated that a free decompression will hasten recovery of function, or, as one would prefer to put it, will result in less permanent derangement of function.

#### THE ŒDEMA OF INTRACRANIAL TUMOUR OR CYST.

One outstanding fact about the œdema associated with an intracranial tumour is that the extent and degree of brain swelling are often out of all proportion to the size of the tumour. And a tumour may be so situated that it cannot possibly interfere with the ventricular circulation, and yet the actual swelling of brain substance may be extreme.

CASE VI. Mrs. F. was aged thirty-seven years. A diagnosis was made of left temporal lobe tumour, and this was confirmed at autopsy. Bilateral papilloœdema and severe headache were present for some weeks. Two hours before her operation was due to commence, she dropped into deep drowsiness and cyanosis, and her respiration ceased, with loss of consciousness. Her medulla had become impacted in the *foramen magnum*. Artificial respiration was continued while a decompression was carried out over the site of the tumour, but she died some two and a half hours after the cessation of respiration. Autopsy revealed the presence of a highly active glioblastoma in the hinder end of the temporal lobe. Judging its limits by macroscopic appearances, the tumour certainly did not exceed the size of a large walnut, nor was the ventricular system encroached upon. And yet the whole brain and brain stem showed the presence of marked swelling and œdema.

That is a frequent observation, and one which many of you could multiply. This neoplastic œdema: (i) varies directly with the degree of malignancy of the tumour, as measured by its proliferative activity, and therefore is more marked and more troublesome in the glioblastoma and medulloblastoma than in the astrocytoma and oligodendroglioma, both relatively slowly growing; (ii) does not depend nearly so much on size or site of tumour; (iii) spreads rapidly to the opposite hemisphere, and by disturbing function may draw many red herrings across the diagnostic path; (iv) differs in ætiology from traumatic œdema, which must begin as a result of increased capillary permeability, due to traumatic shock.

It is possible that the great cellular activity of a glioblastoma is accompanied by a considerable increase in the products of metabolism; and this by increasing the molecular concentration of the tissue fluid in



the adjacent brain, gives rise to cerebral œdema. Or perhaps some actually toxic substance is formed which produces œdema by widespread involvement of capillary endothelium.

These are merely theories. Whatever the cause may be, this neoplastic œdema presents two important aspects: (i) it may render the access to a deep-seated tumour almost impossible unless one is prepared to risk extensive trauma to adjacent brain; (ii) it is the commonest cause of post-operative fatality.

Dandy, in his monograph on the benign tumours of the lateral ventricle, implies, perhaps rather optimistically, that the diagnosis and localization of a tumour of the brain substance are so well established that all that remains is to perfect technique. That may be true, but I feel that there is much to be learnt about the management of neoplastic œdema. It is true that enormous advances have been made in the management of certain tumour groups. The removal of a meningioma has practically become a matter of prevention of hæmorrhage, and a preparedness to deal with such hæmorrhage as may occur. But there is still much to be learned about the removal of a tumour some four to six centimetres beneath the cortex, specially when associated with a small and collapsed ventricle.

Hugh Cairns has recently reviewed the post-operative history of the patients treated by Cushing in 1927, and one finds that in some of these cases the attempted removal of a deep-seated glioma has been attended by many years of useful life. Therefore, there is all the more reason to endeavour to improve our methods of attack upon this type of tumour which is always associated with sufficient cerebral œdema to render most hazardous the access to, and removal of, the tumour. And from my own small experience, even if total enucleation is not possible, a subsequent course of X ray therapy appears at least to have arrested the recurrence of the tumour, enabling the patients to resume their normal activities, though of course sufficient time has not elapsed to label any of them as cured.

I have found last year that the consensus of opinion among British and American neuro-surgeons with regard to the glioblastomata was very pessimistic. The old palliative decompression was considered as likely to add unnecessary discomfort and hemiplegia to the patient's remaining days; and if a pre-operative diagnosis could be reasonably made on clinical grounds, it was agreed that it was kinder to leave this type of patient alone. Kenneth McKenzie, of Toronto, brought forward his method of internal decompression as a means of giving patients up to six months of useful life, in which they would be capable of completing their affairs and even of extracting some enjoyment from life; but death generally occurred from involvement of basal ganglia and nuclei rather than from intracranial pressure.

McKenzie advocated a large osteoplastic craniotomy, the removal of as much tumour as possible, and with it the removal of as much normal brain as could be attempted without risking too much interference with pyramidal tract functions or the life of the patient; in this way he

left a cavity within the brain substance, and wired his bone flap back into position. The tumour was at liberty to grow into this internal decompression during its course of recurrence, but during this period the patient frequently recovered sufficiently to carry on a few more months of reasonable activity and to wind up his affairs, and the fatal ending was generally the result of involvement of the base of the brain rather than of acute intracranial tension.

I wish to refer to yet another aspect of cerebral oedema. It is the oedema of mid-brain and hind-brain which follows the sudden alteration of intracranial tension, generally, of course, a change from high to low pressure. The following cases illustrate fatal results due to reactionary swelling of the hypothalamic and/or medullary regions of the brain subsequent to the sudden release of intracranial tension, a process of

reactionary swelling which must be very similar to that occurring in the renal parenchyma after the too sudden release of pressure in prostatic obstruction.

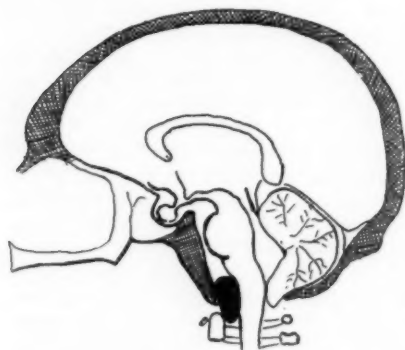


FIGURE VI. Case VIII. Indicating the site of the tumour.

cause for worry, but then her temperature rose rapidly to 40.5° C. (105° F.), and the pulse rate to 160; death occurred about thirty-six hours after the operation, consciousness being retained almost to the end.

The only explanation which would be found for this fatal result was the sudden dislocation of the mid-brain as a result of such great release of pressure.

CASE VIII. Mrs. H., aged forty-four years, was found to have a meningioma arising from the right jugular confluence, growing forwards anterior to the medulla and downwards into the *foramen magnum* (Figure VI). Before operation she had had much vomiting, an irregular pulse and falling blood pressure.

During operation under local anaesthesia, the anaesthetist was much worried by the fluctuations and disturbances of the blood pressure. No more than a decompression was done. Death occurred forty hours later, with pulse climbing to 170, temperature to 41.1° C. (106° F.), late loss of consciousness and death. Ventricular tap and lumbar puncture four hours before death both showed low pressure.

The relief of pressure may have allowed some swelling of the tumour. But I think the probable cause of death was as follows. The pre-operative

CASE VII. J.G., aged eight years, was suspected of having a tumour of the right frontal lobe; her cranium was explored through a large osteoplastic flap. Great increase of intracranial pressure was present. She was found to have a single hydatid cyst in the right frontal lobe with a capacity of over 360 cubic centimetres; the cyst was easily removed, a cavity which seemed to occupy more than one-third of the right hemisphere being left. This was filled with saline solution and the flap was replaced. For twelve hours she gave little

condition showed that her medulla was already suffering from compression. The sudden relief of pressure would cause a reactionary swelling and œdema of this vital region, and complete interruption of the functions of the centres in the medulla.

The sudden relief of tension is badly born by infants and children. I have tried twice to decompress slowly the internal hydrocephalus of children by means of a ureteric catheter passed into the lateral ventricle through a brain needle, endeavouring to follow the lines of decompression of the obstructed urinary bladder. The method is full of technical difficulties, and there is a risk of infection. Perhaps the technique used in meningitis may be better. But this is a very grave complication in any case of internal hydrocephalus.

The type of death is characteristic. For anything up to twelve hours after operation the condition of the patient gives little cause for anxiety. The first disturbing sign is a steadily rising temperature, which does not respond to lumbar puncture or antipyretic measures, sponging and so forth. The pulse at first does not rise parallel with the temperature, but may be irregular. Within a few hours the pulse, too, rises in rate, blood pressure falls, the respiratory rate rises, with suggestion of pulmonary œdema. And not until this stage, very shortly before death, does the patient become quite unconscious.

Moderate hyperthermia is a fairly frequent occurrence in these hydrocephalic cases, and may be present even as soon as the end of the operation. Admittedly most of such patients recover.

But I am certain that five of my own patients died from such a cause; and four of those five patients had a non-malignant condition with good prospects of complete recovery.

#### HYDROCEPHALUS.

##### *Infantile Hydrocephalus.*

The story of the surgical treatment of developmental hydrocephalus is very depressing. An exception may perhaps be made with the Arnold Chiari malformation; though the presence of other developmental abnormalities makes it doubtful whether the prolongation of the lives of these infants is desirable. Many heroic and brilliantly executed operations have been devised, but I know of no permanent successes. It is well worth while, however, investigating the condition of any hydrocephalic infant whose birth record is suggestive of intracranial hæmorrhage.

CASE IX. Baby W. was seen at the age of three weeks. The child was cyanosed at birth, did not cry or breathe well and did not suck well for two days. Examination revealed a hydrocephalic head and internal strabismus.

Bilateral subdural hæmatoma was suspected by Dr. E. Britten Jones and was confirmed by aspiration through the lateral angles of the interior fontanelle. She was treated by aspiration on four occasions, the maximum amount aspirated being 150 and 120 cubic centimetres at the first time. She is now over two years old, and is passing her milestones normally. But she still has a slight squint.

CASE X. Baby McC., aged nine months, had a history that suggested birth injury. No abnormality was noticed till the child was four months of age. When seen at nine months the child had a tremendous head (58.7 centimetres or twenty-three and a half inches), but limbs and trunk appeared normal. A diagnosis of occlusion of the foramina of the fourth ventricle or of *incisura cerebelli* by organized blood was made, and encephalography was performed to decide the site of block. Fifty cubic centimetres of air were injected into the lumbar theca and reached the vertex, but none entered the ventricular system (see Figure VII). At a later estimation, after encephalography, the ventricular fluid was found to have a higher protein content, 15 as to 25 milligrammes per 100 cubic centimetres. Otherwise they were identical. At operation the *cisterna magna* was found to be non-existent. The fourth ventricle was opened through a bulging vermis. The foramina of Majendie and Lucshka were occluded by organized clot, with huge dilatation of the fourth ventricle and Sylvian aqueduct. Death from hyperthermia occurred forty-eight hours later, probably owing to the sudden great drop in intraventricular pressure.

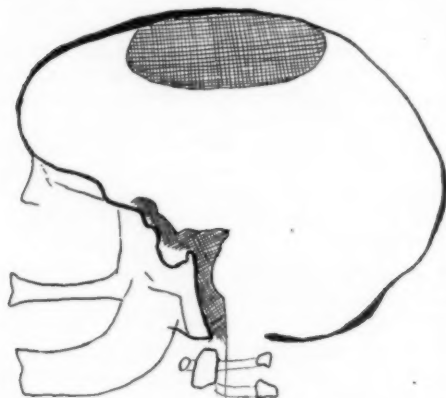


FIGURE VII. Case X. The cross-hatched areas indicate air in the subarachnoid spaces, as mentioned in the text. No air has entered the ventricular system.

#### *Hydrocephalus Following X Ray Therapy.*

When applied to the cerebral hemispheres, X ray therapy appears to have no detrimental effect upon the normal cerebral tissues; but the following case makes one suspect that the use of X ray therapy upon the contents of the posterior fossa may not be without its dangers.

CASE XI. M.L., aged seven years, in January, 1935, had his cerebellum explored for tumour.

A medulloblastoma was found in the left lobe at a depth of three centimetres. It had not encroached upon the interior of the fourth ventricle. Piecemeal removal of a considerable amount of tumour was performed, and three weeks later he was given a course of X ray therapy. For some months the result appeared to be most satisfactory; the patient actually won a swimming race in January, 1936, a year after operation.

But in June, 1936, he reported again, complaining of headache and vomiting, and with a tense bulging area over his suboccipital bone defect. It was obvious that much of the bulging area was due to cerebro-spinal fluid, but an underlying recurrence of tumour was naturally suspected. He became rapidly worse, and the wound was reopened. A large collection of cerebro-spinal fluid was found beneath the scalp flap. The left lobe of the cerebellum was explored, but all that was found was dense scar tissue at the site of the excision of the tumour.

The most important finding was the presence of tough fibrous adhesions all round the *foramen magnum*, in front of the brain stem as well as behind it. These adhesions had effectively prevented the cerebro-spinal fluid from passing up through the *incisura tentorii*, and had produced a type of communicating hydrocephalus.

The child died some six weeks later, and autopsy further confirmed the operation findings. So far the pathologist has been unable to find any trace of tumour tissue.

The cause of the production of the tough fibrous adhesions is open to debate. In my limited experience, when post-operative hydrocephalus has resulted from organization of blood in the region of the *foramen magnum*, it has given rise to signs within a few weeks of operation, and may even occur sooner, giving rise to the formation of a cerebro-spinal fluid fistula. In this case the boy's condition was excellent for over a year, and I feel that the very dense fibrous tissue found was a product of X ray therapy, and would be in keeping with the delayed and prolonged fibrous tissue reaction which is so commonly seen after therapy elsewhere. In a second case, very similar to this, operation has just been performed.

In June, 1936, a considerable portion of a medullo-blastoma was removed from the right lobe of the cerebellum, and three weeks later a course of X ray therapy was administered. The child remained well until the end of July, six months after operation, when signs of recurring hydrocephalus rapidly came on. At a second exploration an exactly similar state of affairs was encountered.

#### *Post-Operative Hydrocephalus.*

Occasionally hydrocephalus follows a cerebellar operation. This is due to organization of blood in the region of the *cisterna magna* and the anterior basal cisterna. It may be the cause of a most troublesome cerebro-spinal bulge beneath the flap, or may even cause a fatal result.

Hugh Cairns told me that he endeavours to preserve the *cisterna magna* intact, except for a needle puncture hole whereby he allows fluid to escape in order to reduce pressure during the operation. A scrupulously dry technique is therefore necessary in operations on the fourth ventricle, and subsequent lumbar punctures may help to get rid of any blood left behind.

#### DISORDERS OF CIRCULATION IN DIAGNOSIS.

We owe to Dandy the idea of replacing the cerebro-spinal fluid by a medium which is non-opaque to X rays. Sterile air or oxygen is generally used, though both lipiodol and "Thorotrast" have been used, the latter being, of course, opaque.

The subjects of encephalography and ventriculography have been frequently discussed in the journal of this college, by other authors as well as myself, and I will now do no more than to show two cases.

CASE XII. Miss K. had been subjected to exploration for a pituitary tumour some six years previously, with negative result. For some reason, the bone flap was displaced after operation and joined at its temporal hinge in the position shown with the bone projecting about 3.75 centimetres (one and a half inches) above the surface of the skull. A year before coming under treatment again she developed constant headaches and epileptic fits, which were followed for twelve to twenty-four hours by vomiting and increased headache in the region of the flap. The encephalogram is a good illustration of the wandering ventricles associated with epilepsy (Figure VIII). She was treated by elevation of the flap, excision of a mass of adherent scar of meninges and degenerated cortex, a fascial transplant and fixation of the bone flap. So far she maintains that she is entirely relieved, but it is quite impossible to assess the effects of surgical treatment of traumatic epilepsy until many years have elapsed.

Professor Harvey Cushing, in speaking of his operative statistics, frequently invoked the royal and ancient game to illustrate his results,

and often referred to his endeavour to bring down his handicap. And just as a scratch man often needs, and receives, a little slice of luck, even so there are days when the merest "rabbit" is helped by the run of the ball. And the following case illustrates such an occasion.

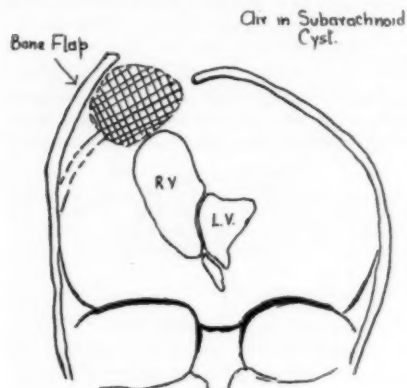


FIGURE VIII. Case XII. Miss K. Encephalogram showing "wandering ventricles" and cyst under flap.

removal. The operation was followed by X ray therapy, with excellent result, and for the last year she has been able to do all her own housework as before. She is of added interest in that she developed a gastric ulcer, proved radiologically, after her second operation.

CASE XIII. Miss B. was seen in November, 1933, obviously with an intracranial tumour, and all her localizing signs pointed to a lesion of the right Gasserian ganglion. It was explored and nothing was found.

When she had recovered sufficiently from the operation, the failure in diagnosis was explained to her, and she agreed to ventriculography. The right ventricle was tapped, emptied and filled with air. On attempting to tap the left ventricle, the needle entered a cyst containing typical yellow, highly albuminous fluid, characteristic of a cyst in association with a tumour (Figure IX). It proved to be a very vascular angioblastic meningioma, and profuse hæmorrhage made me stop at partial

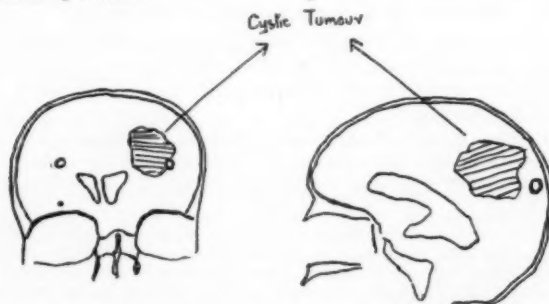


FIGURE IX. Case XIII. Miss B. Ventriculogram showing mid-line shift and cystic tumour filled with air.

This has been a happy ending to a diagnostic mistake. Unfortunately, the ball does not always run so well for us.


#### CONCLUSION.

You will have gathered from my remarks that the path of the neuro-surgeon—and of his patient—is strewn with rocks, and clouded



by disappointments. That, at least, has been my experience. Following Cushing's very severe assessment of results, I may add that of 103 patients of mine, 9 were not subjected to operation; of the remaining 94 patients, 40 are alive. Of these, 28 have returned to their previous occupation or to school.

These results are not nearly good enough when compared with those of oversea clinics. We are not likely to do better until we are permitted to form a clinic, with pathologist, our own theatre and exclusive theatre team, and with resident medical officers trained in neuro-surgery. Far too many patients still die who should not die; and I have endeavoured to describe some of the reasons for failure.



## SQUAMOUS CELLED CARCINOMA OF THE LIP.<sup>1</sup>

By JOHN S. MACMAHON,

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DURING recent years much controversy has taken place over the relative values of different therapeutic measures applied to patients suffering from squamous celled carcinoma of the lip. The treatment of this form of malignant disease, once solely the domain of the surgeon, has now been invaded by the radiotherapist. Surgeons themselves do not offer a common front in their plan of campaign, some being content merely with local excision and observation of the regional glands, while others are adamant that the glands should be removed. These follow the principle of Moynihan in their belief that the surgery of carcinoma is the surgery of the lymphatic system, and, like Fischel, prefer to keep a step ahead instead of running after carcinoma. Both forms of treatment have been sufficiently long entrenched for a statistical reconnaissance to be made, in an endeavour to compare the efficiency of each. It is with the object of throwing light on the many problems which arise out of the treatment of this form of malignant disease that this survey of the patients treated at the Royal Prince Alfred Hospital has been undertaken.

At the Royal Prince Alfred Hospital, Sydney, for a period of sixteen years, from January 1, 1920, until December 31, 1935, 751 patients with squamous celled carcinoma of the lip have been treated as in-patients. No patients treated as out-patients are included in this series. Table I shows the number of patients treated during the individual years.

With the purchase of radium by the Commonwealth Government, and the establishment of a radium clinic at the Royal Prince Alfred Hospital, Sydney, in October, 1928, the number of patients treated annually has been nearly trebled. This cannot be accounted for by increase in population, but by the fact that many more patients were referred to the newly established clinic for radium than were referred to the hospital previously for surgery. This was the result of the propaganda of the cancer campaign to obtain funds for cancer research and treatment. This new form of treatment, which was non-mutilating, and which could be carried out without the use of the scalpel, appealed to the public. The fear of an operation leads many a patient to delay seeking relief until the complications of advanced malignant disease bring him to the surgeon's door. Up to this period surgery was prac-

<sup>1</sup> The investigations reported in this paper were carried out during the author's tenure of the Syme Scholarship for 1936.

TABLE I.

Year.					Number of Patients.
1920	..	..	..	..	28
1921	..	..	..	..	14
1922	..	..	..	..	21
1923	..	..	..	..	28
1924	..	..	..	..	33
1925	..	..	..	..	21
1926	..	..	..	..	31
1927	..	..	..	..	31
1928	..	..	..	..	45 <sup>1</sup>
1929	..	..	..	..	73
1930	..	..	..	..	89
1931	..	..	..	..	76
1932	..	..	..	..	63
1933	..	..	..	..	63
1934	..	..	..	..	70
1935	..	..	..	..	65
Total .. .. .					751

<sup>1</sup> Radium clinic established, October, 1928.

tically the only means employed to combat the disease, with the exception of the use of diathermy in comparatively few cases.

With the advent of radium, while many patients with early squamous celled carcinoma now began to appear at the clinic, many patients with advanced growths of doubtful operability were referred, not only from New South Wales, but also from other States, in the hope that radium might offer a better or more effective means of treatment than surgery.

In the early years of the clinic, radium was often used speculatively in many advanced and hopeless cases, in order to study its effect, until experience taught its limitations. This must of necessity have had its reflection on the results obtained during the probationary period. Now that the graduation period has passed, much better results should follow, because of experience gained, improvement of technique and better selection of cases. These facts should be remembered in assessing the value of radium as a therapeutic means.

The establishment of a radium clinic marked the commencement of an organized follow-up department for patients with malignant disease; consequently those patients who presented themselves for treatment of a squamous celled carcinoma of the lip have in most instances reported for observation at regular intervals ever since, and progress notes have been recorded. A *questionnaire* is sent to each country patient at six-monthly intervals, requesting attendance, if possible, at the clinic for observation or a statement as to his present condition.

Prior to this period no such follow-up department existed. It has been extremely difficult to trace patients treated during the period 1920 to 1928. The exigencies of the post-war period and the recent depression have led to frequent changes of address amongst public hospital patients. In spite of this, 629 patients out of a total of 751 (83.7%) have been

traced to date, which compares favourably with other reported statistics from centres where a follow-up department has been in existence for the full period under review.

Deaths can be readily traced from the records of the Registrar-General's Department. As the present-day addresses of patients treated from 10 to 15 years ago are notoriously difficult to trace, it is generally assumed that the majority of patients from whom no further information can be obtained are still living. The longer one attempts to obtain information, the greater the number of patients traced; consequently the higher, as a rule, is the percentage of cures obtained and the lower the mortality.

The treatment of the glands of the neck in this series of cases has been purely surgical; insertion of radium needles into involved glands has been carried out in one case only, with an ineffective result, and deep X ray therapy has been employed in isolated inoperable cases only. Following the transient wave of enthusiasm for the Blair Bell lead treatment, two patients with inoperable growths received intravenous injections of colloidal lead without benefit.

Prophylactic irradiation of the neck, in any form, has not been carried out in a consecutive number of cases.

During the period under consideration, 10 patients only out of 751 were untreated; two of these refused treatment, and eight were regarded as inoperable because of the hopelessly advanced stage of the disease. The remaining 741 patients were given the benefit of either surgery or radium. The very low percentage of untreated cases compares more than favourably with other reported groups of cases. Out of 1,310 cases of squamous celled carcinoma of the lip reported by Figi from the Mayo Clinic in November, 1934, 327 were untreated. The policy of giving patients with growths of doubtful operability the benefit of treatment has injuriously affected the statistics of this hospital with a consequent high mortality rate during the first three years succeeding treatment.

It may be of interest to review these cases of squamous celled carcinoma of the lip under the headings shown below, and, from the information so acquired, to endeavour to form some opinion with regard to prognosis, the relative value of radium and surgery in the treatment of the local lesion, and as to whether the regional lymph glands should or should not be removed as an essential part of the treatment.

#### AGE AND SEX INCIDENCE.

The distribution of age groups is shown in Table II.

Squamous celled carcinoma of the lip belongs to the post middle-age period of life. There were 626 patients (83.3%) over the age of forty, and of these 502 (66.9%) were over the age of fifty years. Only 125 patients (16.6%) were under the age of forty. The average age of males was fifty-five and of females was sixty. Males were more commonly affected than females in this series in the proportion of 17 to 1, there being 709 males (94.4%) and 42 females (5.5%).

TABLE II.

Age Period.	Patients.	Percentage.
10-19 .. .. .	4	0.53
20-29 .. .. .	33	4.39
30-39 .. .. .	87	11.58
40-49 .. .. .	125	16.64
50-59 .. .. .	172	22.90
60-69 .. .. .	176	23.43
70-79 .. .. .	129	17.17
80-89 .. .. .	24	3.19
90-100 .. .. .	1	0.13
Total .. .. .	751	

The youngest case was that of a patient aged eighteen years, who, on April 16, 1929, had a U-shaped excision of a sore on the right side of the lower lip, which had been present for twelve months. The pathological report showed it to be a squamous celled carcinoma. Six weeks later he was readmitted to hospital with enlarged glands in the sub-maxillary region. These were removed, but proved on examination to be uninvolved. On July 1, 1931, he was readmitted for a recurrence in his lip, for which he had radium needles inserted. He died on April 3, 1933, from carcinoma of the lip and secondary growth in the brain.

Four cases only occurred in the second decade. The patients were all males with a lesion on the lower lip; one of them (case quoted above) was eighteen and three were nineteen years of age. In the third decade the disease reached greater proportions, there being 33 cases. The incidence now showed a rapid increase, with 87 cases in the fourth decade, 125 cases in the fifth decade, 172 cases in the sixth decade, and reached the highest level with 176 cases in the seventh decade—nearly a quarter of the total number of cases (23.43%)—after which, as might be expected, there was a decrease. The oldest patient was a male, aged ninety-one years, who had radium needles inserted into a squamous celled carcinoma of the upper lip, but who died one year later from pneumonia without evident recurrence of his malignant condition.<sup>1</sup>

#### SITE OF INVOLVEMENT.

Table III shows site of primary involvement in both sexes.

The lower lip was involved in 677 cases, the upper lip in 49 cases. In males the lower lip was involved in 648 cases and the upper lip in

<sup>1</sup> Since the termination of this review, a male child, aged four and a half years, a subject of *xeroderma pigmentosum*, was admitted to Gloucester House, Royal Prince Alfred Hospital, on January 5, 1937, suffering from squamous celled carcinoma of the right side of his lower lip, which had been present for three weeks (see Figures I and II). There was enlargement of the regional lymph glands of the right side of the neck. The lesion was excised on January 7, 1937, and proved on pathological examination to be a squamous celled carcinoma of the lip. Dissection of the regional lymph glands was carried out two weeks later. Microscopic examination revealed sinus catarrh and hyperplasia, but there was no evidence of metastases. I am indebted to Mr. F. P. Sandes for permission to report this case.

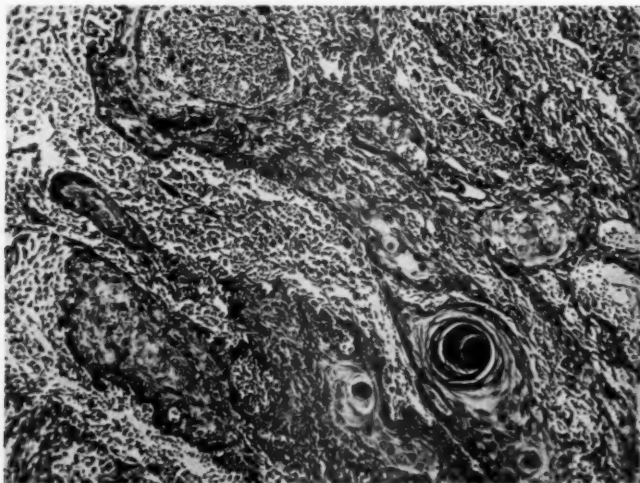


FIGURE I.

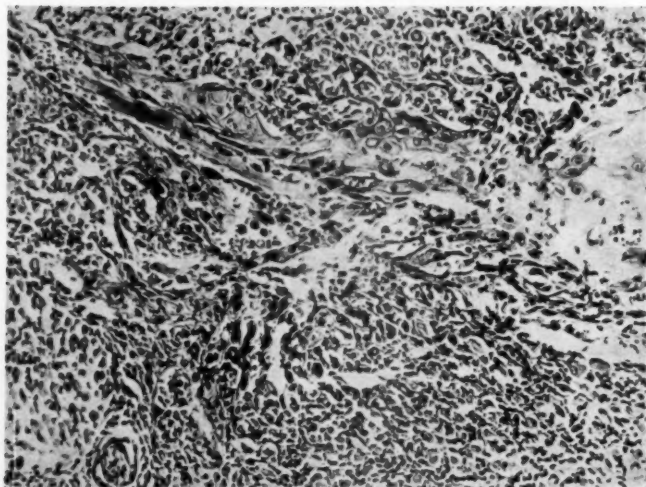


FIGURE II.



TABLE III.

Site.	Males.	Females.	Total.
Lower lip .. .. .	648	29	677
Upper lip .. .. .	40	9	49
Both lips .. .. .	3	—	3
Lower lip and angle of mouth .. .. .	13	1	14
Upper lip and angle of mouth .. .. .	—	2	2
Angles .. .. .	5	1	6
Total .. .. .	709	42	751

40 cases, the proportion being 16 to 1. In females the lower lip was involved in 29 cases and the upper lip in 9, the proportion being 3 to 1. In three patients, all males, both lips were involved with so-called "contact carcinoma".

In six cases the angle of the mouth was the primary site of involvement. These were not cases of extension to the angle of the mouth from a carcinoma of the inner surface of the cheek.

Fourteen patients presented themselves with involvement of the angle of the mouth as an extension from a carcinoma of the lower lip. In two cases a similar involvement of the angle of the mouth occurred as an extension from a carcinoma of the upper lip.

#### ÆTIOLOGY.

The outstanding ætiological factors, attributed by the patients, were chronic irritation from smoking and exposure to the elements, sun and wind. In some instances the lesion commenced as a chronic fissure. The high influence in Australia seems to be due, amongst other things, to subtropical influences on Anglo-Saxon and Celtic races, who are lacking in pigment. The disease is not so common amongst coloured races, and is rare amongst aborigines. There were very few patients in this series who had a positive Wassermann reaction; but there were many instances of rapid increase in growth (as a result of super-added infection and trauma), which favours the formation of metastases.

#### DURATION OF THE DISEASE BEFORE TREATMENT.

The duration of the disease before receipt of treatment, according to the patients' statements, is set out in Table IV.

The patient's statement must be accepted as to duration of the disease, but in many cases is unreliable. Many of the lesions stated to have been present for years need not necessarily have been malignant for the whole period, but may have existed for much of the time as innocent or premalignant conditions; therefore, one cannot always expect a lesion stated to have been present for some years to be of low grade malignancy, even when it is not advanced at the time of examination and is without metastases. The tumours of the lip dealt with in

TABLE IV.

Period of Time.	Number of Patients.
Under 1 month .. .. .	10
1 to 3 months .. .. .	153
4 to 6 months .. .. .	181
7 to 9 months .. .. .	51
10 to 12 months .. .. .	80
1 to 1½ years .. .. .	58
1½ to 2 years .. .. .	42
2 to 3 years .. .. .	27
3 to 5 years .. .. .	31
Over 5 years .. .. .	32
Unknown .. .. .	34
Total .. .. .	699

this series varied greatly in duration; some had been present for only a month or two, others had been present for as long as a year and more.

In more than half the number of cases (50·8%) the lesion had been present for a period longer than six months, in one-third of the cases (32%) longer than one year, and in 17·7% of cases longer than two years.

Because of its characteristic appearance and its prominent situation, carcinoma of the lower lip is readily recognizable, and it is difficult to understand why, in an enlightened community, those affected do not immediately seek medical advice.

#### DIAGNOSIS.

The tumours removed from those patients who were treated surgically have been submitted to pathological examination and are proven cases of squamous celled carcinoma. Biopsies from the 315 cases treated with radium were carried out in 64 cases. In the remaining 151 cases the diagnoses are clinical. But, as carcinoma of the lip presents such characteristic appearances, it is improbable that there are many diagnostic inaccuracies.

Leucoplakia, smoker's patches, and other premalignant conditions treated either by surgical excision or radium, are not included in the series.

#### TREATMENT OF PRIMARY CASES.

During the period under consideration, 751 patients presented themselves for treatment. Of these, 61 cases will be discussed separately, as they were cases of recurrence in patients who had received their previous treatment elsewhere; they are, therefore, regarded as secondary cases. The remaining 690 cases are regarded as primary cases, because the patients presented themselves at the Royal Prince Alfred Hospital for their initial treatment. Of these nine received no treatment: two refused treatment, and the other seven were regarded as unsuitable for

any form of treatment because of the advanced state of the disease. The percentage of recurrences requiring further treatment has been determined from the 690 primary cases.

Prior to October, 1928, surgery was practically the only method employed at the Royal Prince Alfred Hospital in the treatment of squamous celled carcinoma of the lip. Consequently a large number of patients treated surgically and now living have been treated for from eight to ten years. As the majority of recurrences occur within three years of treatment (see Table XII), and recurrences amongst those surviving a five-year period are relatively infrequent, we may regard the patients of this group who are alive today as having survived the danger period. They are comparatively safe and probably cured.

As radium was first employed in the treatment of squamous celled carcinoma of the lip in October, 1928, the patients treated with radium have been treated from one to eight years only; consequently many of these patients are within the five-year period and are still potentially liable to recurrence.

Table V analyses the types of treatment given to the 690 patients who received their primary treatment at the Royal Prince Alfred Hospital. In column I the total number and percentage of traced patients for each individual type of treatment are shown. In columns II, III, IV and V are shown the number of patients treated with each type of treatment for three-, five-, seven- and ten-year periods, together with the survival and the mortality rate. The deaths are divided into groups: those patients dying of intercurrent disease and those dying of the particular form of malignant disease under consideration.

In most statistics of malignant disease the number of survivals, so-called "cures", is given as a percentage based upon the total number of patients treated; usually no account is taken of the actual cause of the deaths. All deaths are attributed to the malignant condition. The fact that many patients, especially those in the past middle-age period of life, die of some intercurrent disease, for example, pneumonia, cerebral hæmorrhage, chronic nephritis *et cetera*, is ignored. Hence those statistics which ignore this fact show a mortality rate higher than that which should be attributed to the malignant condition. In this series of patients, 66.9% of the total were over fifty years of age; many of these died of intercurrent diseases before five to ten years had elapsed since treatment. It is not justifiable, therefore, in comparing the results of different forms of treatment, to attribute these deaths to the malignant condition.

The percentage of survivals and the mortality rate in Table V are based upon the total number of patients treated for the period in question, less those dying from intercurrent disease, since they did not live long enough to be counted as three-, five-, seven- or ten-year survivals, nor to give the tumour time for its inherent right of recurrence.

An example will more readily explain the method adopted. In Table V, column II, 157 patients were treated three years or more by

TABLE V.  
Col. I. II. III. IV. V.

Treatment.	Traced Patients.		Treated 3 years.				Treated 5 years.				Treated 7 years.				Treated 10 years.												
	Total Patients.	Percentage.	Total Number.	Alive.	Percentage.	Died of M.	Died I.D.	Total Number.	Alive.	Percentage.	Died of M.	Died I.D.	Total Number.	Alive.	Percentage.	Died of M.	Died I.D.										
Group 1.—Excision of lip and glands.	221	108	157	135	94.4	8	5.5	14	144	113	93.3	8	6.6	23	121	88	91.4	8	8.3	25	77	47	90.3	5	9.6	25	
Group 2.—Radical excision of lip and glands.	99	90	90.9	64	59	92.1	5	7.8	25	22	88.0	3	12.0	—	1	1	—	—	—	—	—	—	—	—	—	—	
Group 3.—Excision of lip.	130	105	80.7	94	79	89.7	9	10.2	84	61	85.9	10	14.0	13	65	30	76.4	12	23.5	14	38	17	73.9	6	26.0	15	
Group 4.—Radical excision of lip.	215	180	80.5	116	90	84.9	16	15.0	104	70	48	82.7	10	17.2	12	28	18	75.0	6	25.0	4	2	—	—	—	—	
Group 5.—Diathermy therapy lip and glands.	8	8	100	8	5	71.4	2	28.5	1	8	5	71.4	2	28.5	1	7	4	66.6	2	33.3	1	—	—	—	—	—	
Group 6.—X-ray therapy lip and glands.	4	4	—	4	1	—	3	—	3	3	—	—	3	—	—	2	—	—	—	—	1	—	—	—	—	—	
Group 7.—Partial excision mandible and glands.	3	3	—	3	1	—	2	—	3	3	1	—	2	—	—	2	1	—	1	—	2	1	—	1	—	—	
Group 8.—Excision of lower lip and gland.	1	1	—	1	1	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Group 9.—Untreated or refused treatment.	9	7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Total ..	690	572	82.8	447	371	89.1	45	10.8	31	338	251	86.8	38	13.1	49	226	151	82.9	31	17.0	44	120	67	83.7	13	16.2	40

I.D.—Intercurrent disease. M.—Malignant disease (squamous cell carcinoma of lip).

excision of the local lesion of the lip and excision of the regional lymph glands. Of these, 14 died from intercurrent disease, leaving 143 patients, 135 (94.4%) of whom are alive after three years, whilst eight (5.5%) have died from squamous celled carcinoma of the lip.

*Results of Treatment of Primary Cases.*

*Excision of Lip and Glands.*—The results of the various forms of treatment as set out in Table V of traced patients show that excision of the local lesion combined with excision of the glands of the neck has given the best results. In this group of 168 patients there are 94.4% three-year survivals, 93.3% five-year survivals, 91.6% seven-year survivals and 90.3% ten-year survivals, with a mortality rate of 5.5%, 6.6%, 8.3% and 9.6% respectively (Group 1, Table V).

All the deaths from malignant disease in this group occurred within three years of operation. The gradual increase in mortality in the five-, seven- and ten-year periods is due to the fact that a smaller number of patients was treated for those periods. There was no actual increase in the number of deaths.

*Radium Applied to Lip and Excision of the Glands.*—A group of 90 traced patients, who had application of radium to the lip *plus* excision of the glands of the neck, have given the next best results (Group 2, Table V). These, however, can be considered only for the three- and five-year periods, since only one patient has been treated for seven years. In this group the results are not quite so good as in the preceding group, there being 91.8% three-year survivals and 87.4% five-year survivals, with a mortality of 8.1% and 12.5% respectively.

In both these groups, however, in which treatment of the local lesion has been combined with excision of the regional lymph glands, the results are appreciably better than those in which the local lesion only has been treated, and this in spite of the fact that the latter are, generally speaking, earlier cases which should have a better prognosis; but included in these groups are those cases in which local treatment only was given because the patients were regarded as bad general anæsthetic and operative risks.

*Excision of the Lip.*—In the group "excision of the lip", consisting of 105 traced patients, there were 89.7% three-year survivals, 85.9% five-year survivals, 76.4% seven-year survivals and 73.9% ten-year survivals, with a mortality rate of 10.2%, 14%, 23.5% and 26% respectively (Group 3, Table V). No classification according to size of lesion has been given, but included in the group are all those patients who had surgical excision of a squamous celled carcinoma of the lip, either the small lesion removed by V-shaped or U-shaped excision with primary reconstruction, or the partial or total removal of the whole lip for an advanced lesion, requiring a later plastic operation. Within a short period three of these patients with advanced lesions required partial excision of the mandible on account of recurrence, and died within three years.

*Application of Radium to the Lip.*—In the group "radium to the lip only", consisting of 186 traced patients, there are 84.9% three-year survivals, 82.7% five-year survivals, and 75% seven-year survivals, with a mortality rate of 15%, 17.2% and 25% respectively (Group 4, Table V). Included in this group is one patient who required subsequent partial excision of the mandible on account of recurrence and who died within twelve months of operation.

The survival rate is lower and mortality higher than in any of the preceding groups. This is possibly due to the fact, already mentioned, that in the early days of the clinic radium was used speculatively. Many patients then treated would now be regarded as unsuitable and their malignancy too advanced for any form of treatment.

In the other forms of treatment, such as excision of the mandible, diathermy coagulation and deep X ray therapy, there are too few cases from which to draw any definite conclusions.

#### TREATMENT OF SECONDARY CASES.

Table VI indicates the initial type of treatment carried out at the Royal Prince Alfred Hospital in the 61 secondary cases.

TABLE VI.

Treatment.	Total Patients.	Number Traced.	Lived Three Years or More.	Lived Five Years or More.	Lived Seven Years or More.	Lived Ten Years or More.
Group 1.—Excision lip and glands..	7	7	5	5	2	1
Group 2.—Radium to lip and excision glands .. ..	7	7	4	2	—	—
Group 3.—Excision lip .. ..	14	11	5	4	1	1
Group 4.—Radium lip .. ..	19	18	13	11	7	—
Group 5.—Diathermy coagulation lip .. ..	4	4	3	3	2	—
Group 6.—Diathermy to lip and excision glands .. ..	1	1	1	1	1	—
Group 7.—Excision lip and radium .. ..	1	1	1	1	—	—
Group 8.—Excision lip and mandible .. ..	6	6	3	1	1	1
Group 9.—Radium to lip and colloidal lead .. ..	1	1	—	—	—	—
Group 10.—No treatment .. ..	1	1	—	—	—	—
Total .. ..	61	57	35	28	14	3

The number of patients treated in the individual groups are too few to permit of drawing any definite conclusions as to the effectiveness of each type of treatment. Many of these patients required two or three treatments on account of recurrence, and evidence of various combinations of surgery and treatment with radium are common in the records of this group.

No less than six of the eighteen traced patients (see Table VI, Group 4) who received radium as their first treatment at the Royal



Prince Alfred Hospital, later required excision on account of recurrence of the tumour, whereas three of eleven traced patients (see Table VI, Group 3) who had excision of the tumour as their initial treatment at the Royal Prince Alfred Hospital later required insertion of radium needles on account of recurrence.

#### COMPARISON OF END RESULTS OF PRIMARY AND SECONDARY CASES.

In Table VII the end results of treatment of primary and secondary cases are compared.

In five years 86.8% of the patients with primary growths have survived and 73.6% of those with secondary growths. In ten years 83.7% of those with primary growths have survived and only 42.8% of those with secondary growths. Secondary growths which are all recurrences must have primarily been of a high grade of malignancy. That the secondary growths have a worse prognosis than primary growths is borne out by all statistics.

This cannot be attributed solely to ineffectual primary treatment, but mainly to additional influences, such as the grade of malignancy, the duration of the primary lesion before treatment, and the age of the patient. Recurrence having once occurred, there is a tendency for further recurrences to develop.

Local recurrences, if treated radically before the regional lymph glands are involved, still offer a good prognosis. Once the regional lymph glands are involved the prognosis is considerably worse.

#### RECURRENCES.

A consideration of the mortality and survival rate after the various forms of treatment epitomized in

TABLE VII.

Treatment.	Traced Patients.		Treated 3 years.				Treated 5 years.				Treated 7 years.				Treated 10 years.												
	Total Patients.	Patients.	Percentage.	Total Number.	Alive.	Percentage.	Died of M.	Percentage.	Died I.D.	Total Number.	Alive.	Percentage.	Died of M.	Percentage.	Died I.D.	Total Number.	Alive.	Percentage.	Died of M.	Percentage.	Died I.D.						
Primary ..	690	572	82.8	447	371	80.1	45	10.8	31	338	251	80.8	38	13.1	49	226	151	82.9	31	17.0	44	120	67	83.7	13	16.2	40
Secondary ..	61	57	93.4	45	35	83.3	7	16.6	3	41	28	73.6	10	26.3	3	29	15	65.2	8	34.7	6	14	3	42.8	4	57.1	7

M. = Malignant disease. I.D. = Intercurrent disease.

Table V is inadequate for determining the effectiveness of each, unless the recurrences which required secondary treatment are included. The most effective means of treatment should show the least number of recurrences, as well as the highest survival rate and the lowest mortality.

The recurrences after the various forms of treatment of the 690 patients who received their primary treatment at the Royal Prince Alfred Hospital are shown in Table VIII. In this table the types of treatment are indicated, also the total number of patients treated, together with the number and site of recurrences for each particular form of treatment.

TABLE VIII.

Treatment.	Total Number.	Recurrences.	Lip.	Lip and Glands.	Glands.	Recurrence Lip.		Recurrence Glands.	
						Total.	Per-centage.	Total.	Per-centage.
Excision of lip and glands .. ..	221	12	9	1	2	10	4.5	3	1.35
Radium lip and excision glands ..	99	7	4	2	1	6	6.05	3	3.03
Excision of lip ..	130	13	7	3	3	10	7.6	6	4.6
Radium to lip ..	215	30	17	5	8	22	10.2	13	6.0
Diathermy coagulation lip .. ..	8	4	3	1	—	4	50.0	1	12.5
X ray therapy ..	4	2	2	—	—	2	—	—	—
Total.. ..	677	68	42	12	14	54		26	

#### Local Recurrence.

The number of local recurrences in the series requiring further treatment is a matter for comment. Three hundred and fifty-one patients had surgical excision of a squamous celled carcinoma of the lip. Of these, 130 had excision of the tumour alone, and 221 had excision of the tumour and glands of the neck (see Table VIII). Twenty of these patients (5.6%) required subsequent treatment on account of local recurrences; in four of these local recurrence was associated with the development of metastases in glands of the neck.

A further local excision was carried out in 13 of these patients, and the tumours are pathologically proven cases of recurrence. Of the remainder, three were treated by radium, two by diathermy coagulation, whilst two were considered inoperable. The last-mentioned are clinical diagnoses without biopsy examination.

Three hundred and fourteen patients were treated for squamous celled carcinoma by means of radium. Of these, 215 had radium needling of the local lesion only, whilst 99 had radium needling locally in addition to a surgical excision of the glands of the neck (see Table VIII).

Twenty-eight of these patients (8.8%) required further treatment for local recurrences, and in seven of them local recurrence was associated with the development of metastases in the glands of the neck.

Of the recurrences after radium, 16 were treated by excision, and are pathologically proven recurrences. Of the remainder, 11 were treated by a second application of radium and one case was considered inoperable. The last-mentioned are clinical diagnoses; no biopsy was taken.

Eight patients only were treated by diathermy coagulation and, of these, four returned with local recurrence. In one case there was development of metastases in the glands of the neck. Figi has stated that the use of any agent which tends to produce an acute inflammatory reaction in the growth or in the tissues immediately about it, without completely destroying the lesion, is likely to be followed by increased activity, with greater likelihood of metastases. The above small series of cases treated by diathermy coagulation supports this view.

The percentage of local recurrences mentioned above, although high, are minimum figures, since they are based upon the total number of patients treated; some untraced patients may have been treated elsewhere for recurrences.

To estimate the true local recurrence rate there should be added the number of patients who died of the disease with a local recurrence, as well as general metastases. It is impossible to estimate this correctly on account of the vagueness of death certificates.

Whilst undoubtedly in some of these cases new lesions may have developed in adjacent untreated premalignant conditions of the lip, the evidence obtained from the records of "indurated ulcer developing in scar of previous operation" and "recurrence after radium" must be accepted as that of a true local recurrence.

In the series there were undoubtedly seven cases in which a new primary lesion developed. In two of these patients who had previously been treated for a squamous celled carcinoma of the lower lip, a lesion developed in the upper lip.

The development of a new primary lesion in the lip of a patient previously treated for squamous celled carcinoma of the lip in which there had been a persistence of the local cause or a neglected premalignant condition, such as leucoplakia, chronic fissure, or smoker's patches, is well known and is illustrated by the following case.

CASE I.—E.G., a male, aged fifty-seven years, was admitted to the Royal Prince Alfred Hospital on January 29, 1922, with an indurated ulcer, 0.5 centimetre in diameter, which had been present for twelve months on the right side of the lower lip. On January 30, 1922, a U-shaped excision of the tumour and excision of the submaxillary and submental lymph glands were carried out on both sides. Pathological examination confirmed the diagnosis of squamous celled carcinoma of the lip. No metastases were found in the lymph glands.

On December 8, 1936, the patient was readmitted to hospital with a new primary squamous celled carcinoma of the lip, this time on the left side and over 2.5 centimetres (one inch) from the scar of the previous operation. He stated that for eight to ten years his lip had been dry, scaly and in parts wart-like.

*Recurrences in Lymph Glands.*

One hundred and thirty patients had excision of a squamous celled carcinoma of the lip; six of these patients (4.6%) were subsequently treated for metastases in the glands of the neck (see Table VIII).

Two hundred and fifteen patients had radium needling of a squamous celled carcinoma of the lip; thirteen of these (6%) required subsequent treatment for metastases in the glands of the neck.

From Table VIII it can be seen that 353 patients out of the 690 with primary growths received local treatment only. Of these, 20 (5.6%) required further treatment for metastases developing in the regional lymph glands.

It is interesting to compare these percentages with the percentage (4.3) of patients who had non-palpable glands removed at operation which were found to be involved with metastases (see Table X). It would seem, therefore, that some patients who subsequently developed recurrence in the lymph glands must have had non-palpable glands containing metastases at the time when the treatment of the "local lesion only was carried out". These are all metastases developing in the lymph glands, proven pathologically after their removal at a secondary operation.

The lymph glands were involved with metastases in 26 of the 68 primary cases in which recurrence occurred. In 12 of these there was an association of local recurrence with recurrence in the lymph glands.

Local recurrences always favour the development of metastases, and secondary cases always show a higher percentage of glandular involvement than do primary cases.

From Table VIII it will be seen that, of the 320 patients who had excision of the glands of the neck combined with local treatment, six returned on account of recurrences in the lymph glands. It is noteworthy that in all cases the glands of the submaxillary region were involved with metastases at the primary operation, and at a later date recurrences appeared in the deep cervical glands beneath the sternomastoid muscle or in the posterior triangle of the neck. Removal of the glands of the submaxillary triangles was insufficient. These cases support the view that removal of the deep cervical glands as a secondary operation should be carried out in those cases in which metastases are found in the glands of the submaxillary triangle.

CASE II.—J.R., a male, aged sixty-four years, was admitted to the Royal Prince Alfred Hospital on August 26, 1935, with a squamous celled carcinoma of the centre of his lower lip, 3.5 by 2.0 centimetres. The cervical glands were not palpable. On August 30, 1935, radium needles were inserted into the lip, and the submental and submaxillary glands of both sides were excised. Pathological examination showed the glands to be involved with metastases. On November 17, 1936, the patient was readmitted with enlarged deep cervical glands on the right side of the neck, which were found at operation to be irremovable.

*Site of Recurrences in the Secondary Cases.*

Table IX indicates the site of recurrence in the 61 secondary cases and the initial treatment carried out.

TABLE IX.

Previous Treatment.	Number.	Site of Recurrence.			Recurrence Lip.	Recurrence Glands.
		Lip.	Lip and Glands.	Glands.		
Excision of lip and glands ..	13	7	4	2	11	6
Radium lip and excision of glands ..	1	1	—	—	1	—
Excision of lip ..	36	26	7	3	33	10
Radium to lip ..	9	8	1	—	9	1
Diathermy coagulation lip ..	1	1	—	—	1	—
X ray therapy ..	1	1	—	—	1	—
Total ..	61	44	12	5	56	17

The 61 patients who received their primary treatment elsewhere, and who attended the Royal Prince Alfred Hospital on account of recurrences, are of interest from the point of view of the site of recurrence and the type of treatment previously carried out.

In 44 cases there was a recurrence of the local lesion only. In 12 additional cases there was a recurrence of the local lesion in conjunction with the development of metastases in the regional lymph glands. In five cases metastases developed in the regional lymph glands, while the primary lesion remained apparently cured.

The high proportion of local recurrences is again to be noted. It is also noteworthy that in 12 out of the 17 cases in which metastases developed in the regional glands, the glandular metastases occurred concurrently with recurrence of the local lesion, again indicating that local recurrence favours the development of metastases.

Four patients in the group of 17 with glandular metastases had removal of the regional lymph glands on one side only for a primary carcinoma of the lip situated laterally. Metastases developed in the lymph glands of the opposite side of the neck, indicating that bilateral dissection of the lymph glands should be carried out in all cases, because tumours of mid-line structures, such as the lip, metastasize bilaterally.

It is interesting to note that the figures of Table VII and Table IX are almost identical, and show the same high proportion of local recurrences. Considering the cases of both tables together from the point of view of recurrences, out of the total 129 patients 86 had local recurrences and 43 had recurrences in the regional lymphatic glands. Of the latter, 24 had metastases in the lymph glands concurrently with a recurrence of the local lesion, and 19 patients only had metastases in the regional lymph glands associated with an apparent cure of the primary lesion.

In young people, squamous celled carcinoma of the lip is sometimes highly malignant, and is prone to recur locally, and this in spite of the type of treatment carried out. It is not uncommon for the patients to

return time after time on account of a local recurrence, finally requiring partial excision of the mandible. Some of these patients die from the complications of local extension rather than from metastases.

In the above series there were three such patients illustrated by the following case:

CASE III.—S.B., a male, aged twenty-seven years, was admitted to the Royal Prince Alfred Hospital on January 31, 1936. Four years previously distance radium had been applied to a squamous celled carcinoma of the left side of his lower lip, which recurred six months later, and for which insertion of radium needles was carried out.

The tumour did not quite disappear, remaining as a small hard nodule for three years, when it again assumed activity.

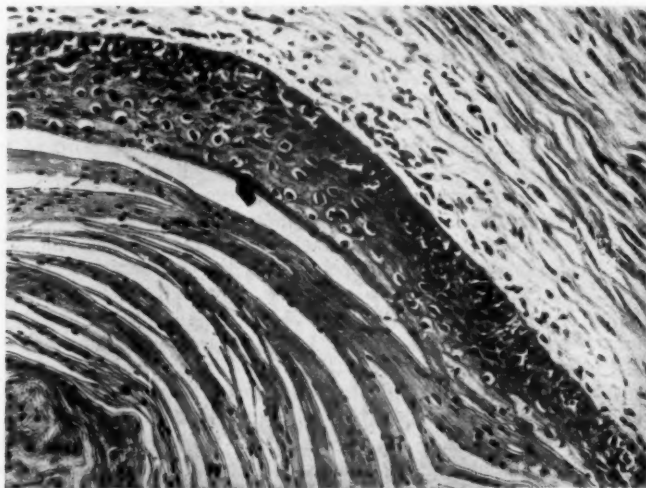


FIGURE III.

On the patient's admission to hospital there was an elongated tumour, 1.5 by 1.0 centimetres, on the left side of the lower lip. The overlying skin was puckered, with a small central discharging sinus.

On the day of admission, January 31, 1936, a V-shaped excision of the tumour was carried out under local anaesthesia, the pathological report of which was squamous celled carcinoma of the lip. In view of the patient's age, post-operative radium needling into the surrounding tissue was carried out as a precautionary measure.

The patient was readmitted to hospital on May 22, 1936, with enlarged submental and submaxillary lymph glands, obviously the site of metastases. Excision of the lymph glands of the submental and both submaxillary triangles was carried out on May 22, 1936.

The patient was again admitted on November 20, 1936, with involvement of the left mental node and a second mass 4.0 by 2.5 centimetres adherent to the mandible in the region of the left mental foramen. Resection of half of the mandible was performed on November 28, 1936, and block dissection of the glands of the left side of the neck two weeks later.



Classification according to Broders showed this tumour to be mainly Grade I (see Figure III). In one area, however, the cells were active and of Grade III (see Figure IV). This case illustrates the futility of biopsy in determining the grading of the tumours, which can be determined only from the most malignant area after removal and section of the whole tumour.

It is interesting to note that in the metastases Grade I type of cell predominated.

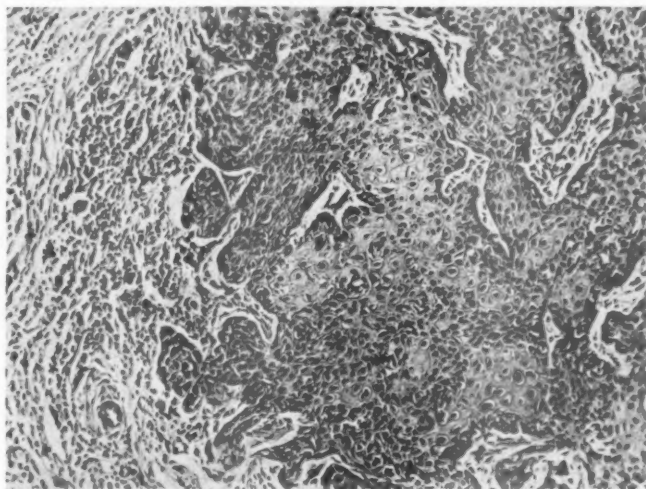


FIGURE IV.

*Consideration of Lymph Glands Removed at Operation.*

In Table X is shown the number of patients out of the total number with primary tumours whose cervical glands, removed at operation, were examined pathologically and found to be involved with metastases. The percentage of palpable and non-palpable glands involved is shown.

TABLE X.  
*Glands Removed at Operation—Examined Pathologically.*

Glands Examined.	Number.	Malignant.	Percentage.
Palpable .. .. .	115	23	20.0
Non-palpable .. .. .	184	8	4.3
Total .. .. .	299	31	10.3

Of those with primary tumours, 320 patients had excision of the glands of the neck as a routine part of their treatment. In 299 cases pathological examination was carried out, which showed 31 (10.3%) to be involved with metastases. In 115 cases the glands were recorded as clinically palpable, which does not necessarily mean that they were regarded clinically as being involved with metastases, but were suspicious on account of enlargement. Of the palpable glands, 23 (20%) were found to be involved with metastases on pathological examination. Of the remainder, the majority revealed sinus catarrh and hyperplasia, the exact significance of which is imperfectly understood.

In 184 cases the glands were non-palpable; in eight of these (4.3%) the glands were found to be involved with metastases.

The percentage of glands removed and found to be microscopically malignant must be regarded as the minimum. Negative findings do not necessarily mean that there are no cancer cells present in the lymph glands, since serial sections of all lymph glands is impracticable and a small group of cancer cells might easily be overlooked. It simply means that the pathologist has not found cancer cells in the sections he has examined. On the other hand, a positive report gives complete assurance that cancer is present.

Altogether, 64 patients had removal of the glands of the neck, which were found to be involved with metastases on pathological examination.

TABLE XI.  
*Age by Decades of Patients with Cervical Metastases.*

Decade.	Number.	Percentage.
10-19 .. .. .	0	0
20-29 .. .. .	1	3.3
30-39 .. .. .	3	3.4
40-49 .. .. .	5	4.0
50-59 .. .. .	20	11.6
60-69 .. .. .	21	11.9
70-79 .. .. .	13	10.0
80-89 .. .. .	1	4.1
90-99 .. .. .	0	0

It is of interest to note the high incidence of patients with cervical metastases in the sixth, seventh and eighth decades. The highest incidence is in the seventh decade. There is no evidence in this series of cases that younger patients are more likely to develop metastases in lymph glands.

In general, in the above series the age by decades of patients treated for cervical metastases follows the general incidence in decades of the disease (see Table II).

In 43 of the primary cases in which metastases occurred in the lymph glands, the duration of the lesion before treatment was stated. In seven cases it was present for under three months, and in 19 for under

TABLE XII.

*Duration of the Lesion Before Receipt of Treatment in Patients with Lymph Gland Metastases.*

Period of Time.	Number of Cases.
1-3 months .. .. .	7
4-6 months .. .. .	12
7-9 months .. .. .	2
10-12 months .. .. .	4
1-1½ years .. .. .	8
1½-2 years .. .. .	3
3-5 years .. .. .	3
Over 5 years .. .. .	4
Total .. .. .	43

six months. Brief duration of the lesion before treatment does not, therefore, assure safety from metastases. In 18 cases the lesion had been present for over one year, and in four cases for over five years, but they need not necessarily have been malignant for that time.

In Table XIII is shown the three-, five-, seven- and ten-year survivals of those patients with involvement of the lymph glands at operation.

Of the above series of 54 traced patients, 52% are alive after three years or more, 36.1% after five years or more, and 22.2% after seven years. There are no patients alive after ten years.

Figi, in a larger series of 85 traced patients reported from the Mayo Clinic, found that 49.2% lived three years or more, 39.12% lived five years or more and 23.67% lived ten years or more. In his series Figi does not exclude patients dying of intercurrent disease; in this group of cases there was only one patient who died of intercurrent disease within five years, so that the two sets of figures are directly comparable. Bloodgood has stated that 50% or more of those patients with metastases in lymph glands are alive five years or more after operation.

The results in the above small series of patients treated at the Royal Prince Alfred Hospital are in agreement with the results reported by other surgeons, and indicate that once the cervical lymph glands are involved with metastases the prognosis is considerably worse. Better results in the above series might have been obtained by more radical dissections as indicated previously. The fact that 52% of patients lived three years and 36.1% five years, whilst 22.2% lived seven years, renders the operation justifiable.

#### OPERATIVE MORTALITY.

In the series there were no operative deaths associated with local excision of a tumour of the lip. Complications following this minor procedure are extremely unusual. Operations can be readily carried out under local anaesthesia in those patients whose general condition renders general anaesthesia inadvisable.



TABLE XIV.

Total Number of Cases Treated.	Traced.	Died 1-3 Years.	Died 3-5 Years.	Died 5-7 Years.	Died 7-10 Years.
751	629	68	3	6	1

would cause death within three years of treatment. Grading of these tumours according to Broders's classification has not been carried out in very many cases. The value of this procedure is doubtful owing to the fallacies that may arise. Grading of biopsies is valueless. The grade of malignancy can be of value only when the section examined is taken from the most malignant part of the whole tumour, as all grades of cell differentiation can at times be found in the one lesion.

The necessity for keeping patients under observation during the danger period of at least the first three years after treatment is borne out by this table.

#### DEATHS FROM OTHER FORMS OF MALIGNANT DISEASE.

In Table XV is shown the number of patients who died of malignant disease affecting primarily some other organ.

TABLE XV.

Cause of Death.	Number.
Carcinoma of stomach .. .. .	14
Skin carcinoma other than lip .. .	6
Carcinoma of colon .. .. .	3
Pancreas .. .. .	2
Pharynx .. .. .	2
Tongue .. .. .	2
Tonsil .. .. .	1
Bladder .. .. .	1
Penis .. .. .	1
Total .. .. .	32

A study of the death certificates of patients who died of intercurrent disease indicates that whilst many died of such conditions as pneumonia, cerebral hæmorrhage *et cetera*, a surprisingly large number were stated to have died from malignant disease affecting primarily some other organ (see Table XV)—an indication of the malignant diathesis of these patients.

#### SYNOPSIS.

1. Seven hundred and fifty-one patients suffering from squamous celled carcinoma of the lip treated as in-patients at the Royal Prince Alfred Hospital have been reviewed; of these 629 (83·7%) have been traced.

2. Since the establishment of the radium clinic at the Royal Prince Alfred Hospital the number of patients treated annually has nearly trebled.

3. The age incidence has been shown in decades, the highest incidence being in the seventh decade (23.43%); 83.3% of patients were over the age of forty years, and 66.9% were over the age of fifty years.

4. Males were more commonly affected than females, in the proportion of 17 to 1. There were 709 males and 42 females.

5. The upper lip was involved in 49 cases.

6. In more than half the cases (50.8%) the lesion had been present for a period longer than six months before receipt of treatment, and in one-third (32%) of cases for a period longer than one year.

7. A study of the results of treatment carried out indicates that better results followed local treatment combined with excision of the glands of the neck than local treatment only.

8. In the series the results of treatment of the local lesion with radium were inferior to those of surgery.

9. The results of the various types of treatment carried out in order of efficiency were: excision of lip and glands, application of radium to the lip and excision of glands, excision of the local lesion, and the application of radium to the local lesion.

10. The secondary cases showed a worse prognosis than primary cases. Comparison of the end results of primary and secondary cases revealed that, whereas 86.8% of patients with primary growths lived five years or more and 83.7% lived ten years or more, 84.6% of patients with secondary growths lived five years or more and 42.8% lived ten years or more.

11. Local recurrences requiring further treatment occurred in 5.6% of cases following excision and in 8.8% following radium. The high incidence of local recurrence following both forms of treatment is noted.

12. Local recurrence favours the development of metastases. More than half the patients with metastases in the lymph glands had an associated local recurrence.

13. Six patients who had removal of the glands of the submaxillary region as a primary operation developed metastases in the deep cervical glands. In all cases metastases were present in the glands removed at the primary operation.

14. Four patients who had unilateral dissection of the glands of the neck developed metastases in the glands of the opposite side.

15. Of patients who had local treatment only, 8.7% received further treatment for cervical metastases.

16. Biopsy for determining the grade of malignancy of tumours according to Broders's classification is unreliable.

17. Of 299 patients who had excision of the cervical glands, 31, or 10.3%, were found to suffer from metastases. Of palpable glands, 20% were found to be involved and 4.3% of non-palpable glands.



18. There is no indication in this series that metastases in lymph glands are more frequent in young patients.

19. In seven patients who developed metastases in the lymph glands following local treatment of a squamous celled carcinoma of the lip, the lesion had been present under three months, and in 17 patients it had been present under six months, indicating that brief duration of the lesion does not assure safety from metastases.

20. The prognosis is considerably worse in those patients whose cervical glands are involved with metastases; in this series only 52% survived three years, 36.3% five years, and 22.2% seven years.

21. The operative mortality of 320 patients upon whom removal of the glands of the neck was carried out, was 1.5%.

22. Consideration of the total deaths attributed to squamous celled carcinoma show that 12.4% of the traced patients, or 10.3% of the total, died of the disease.

23. Of 78 patients who died directly as a result of the disease, 68 died within three years, and 71 died within five years; there were only seven additional deaths from squamous celled carcinoma in the five- to ten-year period.

24. Amongst those who died of intercurrent disease, the high incidence of malignant disease affecting primarily some other organ is an indication of the malignant diathesis of the patients.

#### CONCLUSIONS.

In this series of 751 in-patients treated at the Royal Prince Alfred Hospital for squamous celled carcinoma of the lip, of whom 629 have been traced, there have been 78 deaths (12.4%) occurring directly as a result of the disease. This is a high mortality, and it is obviously the duty of those to whom patients appeal for relief to take stock of the means at their disposal for treatment and to clarify their ideas as to what constitutes rational treatment.

There has been an increasing tendency of late to regard this disease lightly, with indifference to its morbid potentialities amounting almost to blind optimism. It has not received the respect due to its highly malignant nature.

There has been a growing tendency to replace the exacting radical measures of our predecessors by complacent conservatism induced by the modern methods of treatment at our disposal.

Many forms of treatment are vaunted, each with its own advocates, which is itself an indication of the need for improvement.

What form of treatment offers the patient the best prospects of cure? Is the modern trend of treatment in the best interest of the patient? Bloodgood has pointed out that many of the cases of squamous celled carcinoma of the lip commence in premalignant conditions, which are readily amenable to treatment, and that if all the premalignant conditions of the lip could be treated there would be few cases of carcinoma of the lip.

As in all types of malignant disease, the best results are obtained by treatment of early lesions.

Squamous celled carcinoma of the lip lends itself to early diagnosis, and since the lip and glands are readily accessible, it should be one of the most favourable types of malignant disease, if treated effectively.

In spite of this fact, in the above series of cases over one-half (50.8%) of the patients did not present themselves for treatment until the lesion had been present for six months or longer, and in one-third (32%) of the patients the lesion had been present for over one year. It would appear that education of the public is needed. Surely the public should be made aware of the danger of chronic labial lesions and be induced to seek medical advice when such lesions tend to persist. Much more may be done by inducing the public to attend earlier for treatment than by any refinement of operative procedure.

One must not be misled into regarding a long history of the local lesion as an indication of low grade malignancy. The public have not the discriminative power of distinguishing premalignant from malignant conditions. These lesions may have existed as a premalignant condition for much of the time.

Many of the bad results are attributed to delay on the part of the patient in seeking surgical aid, for in some of the advanced lesions local recurrence and metastases are prone to occur in a certain proportion of cases, no matter what therapeutic means are adopted to combat the disease.

Any type of treatment that completely destroys the local lesion must be regarded as effective.

Most of the recurrences requiring further treatment have been local recurrences.

Of the 690 patients who received their primary treatment at the Royal Prince Alfred Hospital, 64 required further treatment on account of recurrence. Of these, no less than 54 required treatment for recurrence of the local lesion, which itself indicates that more radical local measures should be adopted if improved results are to be obtained. This applies particularly to young patients in whom a squamous celled carcinoma of the lip is prone to recur locally, time after time, often causing death by extension rather than by metastases.

Radium in this series has given results inferior to those of surgery, and local recurrences have been more frequent after radium than after excision.

Surgeons must be more radical in the extent of the local excision. Consideration of cosmetic results should be of secondary importance in treating a disease with a mortality as high as that of squamous celled carcinoma of the lip.

Crile has shown that lesions of the lower lip metastasize in the submental and submaxillary glands, later involving the deep cervical and thoracic glands. These neoplasms rarely metastasize to distal

organs; the collar of lymphatics about the neck forms an almost impassable barrier through which cancer rarely penetrates.

Metastases were found in 31 (10.3%) of the 299 patients whose excised glands were examined pathologically. Of palpable lymph glands 20% were involved and 4.3% of non-palpable glands were involved.

Other reported statistics show even a higher percentage of involvement. Figi in his series of 549 cases found 91 (16.53%) to contain metastases. Kennedy's figures were even higher: 33% of palpable glands and 14% of non-palpable glands were involved; 24% of the total contained metastases. This appears to offer irrefutable evidence of the necessity for treatment of the regional lymph glands as an essential adjunct to treatment of the local lesion.

In our present state of knowledge surgical excision is the only efficient form of attack, and should be carried out in all cases unless some more effective method replaces it, or until our knowledge of pathology increases in the direction of our being able to recognize those types of tumour that are unlikely to develop metastases, then, and then only, will it be safe to "watch the glands".

Removal of the lymph glands should include excision of the submental and submaxillary groups, together with the glands of the jugulo-digastric angles of both sides. Should these glands be found on routine pathological examination to be involved with metastases, removal of the deep cervical glands should be carried out at a second operation. An operative mortality of 1.5% is negligible compared with the benefits that accrue from removal of the glands.

From a study of the 64 patients in whose excised glands metastases were found pathologically, there was no evidence to show that younger patients are more prone to develop metastases. It was demonstrable that brief duration of the lesion cannot be accepted as an indication that metastases are not present and are unlikely to occur, or that local treatment only should be carried out.

Until more is known of the nature of malignant disease, it is more rational to seek reasons for not removing the glands than to seek reasons for removing them.

The need for post-operative supervision during the danger period of three years is apparent. The pendulum has swung too far in the direction of conservatism; recognition of the gravity of the condition should lead to a return to more rational treatment.

#### ACKNOWLEDGEMENTS.

I am indebted to the Registrar-General of Births, Deaths and Marriages and to the Department of Police of New South Wales for their valuable assistance in tracing patients; and also to Miss M. M. Cunningham of the Follow-up Department, Royal Prince Alfred Hospital.

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## Surgical Technique.

### A NEW METHOD OF HEAD-FIXATION FOR OPERATIONS IN THE SITTING POSITION.

By GILBERT PHILLIPS,

*Honorary Neurosurgeon, Lewisham Hospital; Honorary Assistant Neurosurgeon,  
Royal Prince Alfred Hospital.*

[From the Department of Surgery, Sydney University.]

THE sitting position for cranial operations was first used extensively by de Martel, of Paris. He advocated this position since it facilitated venous drainage from the intracranial contents and resulted in a relatively bloodless field. At the present time the sitting posture is fashionable for a number of neurosurgical operations. Adson, at the Mayo Clinic, has advocated, and still uses, a special chair and head-rest for cerebellar operations in the sitting position. It is common practice everywhere to use the sitting position in operations on the sensory root of the semilunar ganglion. The main objection to this position arises when the question of anaesthesia is considered. "Avertin" should not be used with the patient sitting up, particularly for patients over thirty years of age. A number of catastrophes have been recorded when "Avertin" has been used for patients in the upright position. In some cases the patient did not recover consciousness after operation; in others, particularly in persons with cardio-vascular disease, post-operative thrombosis and embolism have occurred. The author saw recently in New York a patient with paraplegia resulting from anterior spinal artery thrombosis secondary to "Avertin" anaesthesia given to him in the sitting position for the operation of trigeminal sensory root section. "Avertin" is always succeeded by a fall in blood pressure, and, although it is a safe and desirable anaesthetic for intracranial operations on patients in the horizontal position, the blood pressure fall which accompanies it may, when the patient is upright, be compounded with existing cerebral vascular disease and precipitate catastrophe. Ether given by the intratracheal method and nitrous oxide are probably the safest anaesthetics to use when the patient is vertical. Peet, at Ann Arbor, sections the trigeminal sensory root under local anaesthesia, having given a large dose of hyoscine some hours before operation. In difficult cases the operation may be prolonged for two and a half to three hours in middle-aged patients under ether or nitrous oxide anaesthesia without untoward consequences.

One of the major difficulties in this procedure is to secure rigid fixation of the head. A number of devices have been constructed for this purpose, and consist mainly in rubber- or leather-covered pads which are normally apposed to the side, front and back of the head, and are attached by clamps to the chair. Even with as many as four pads this method does not ensure adequate fixation, and the multiplicity of supports is liable seriously to encumber the operation field. The method to be described here is recommended for its simplicity, its rapid application to heads of any size, its stability and for the fact that the two supports, which are alone required, are so placed that they do not interfere in any way either with the activities of the surgeon or with the visual fields of his assistants. This method has been in use at Lewisham Hospital for the past two years, and has proved eminently satisfactory.

The chair is an ordinary enamel chair of the dental pattern, capable of being raised or lowered by an hydraulic pump, or extended into the form of a couch by means of a lever operating on a ratchet. In the Lewisham Hospital model all wooden and leather portions have been removed and replaced by stainless steel.



FIGURE I.



FIGURE II.



FIGURE III.

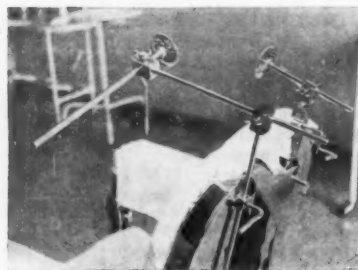


FIGURE IV.

covered, where necessary, with sponge rubber swabs which can be removed as desired. In the chair the patient's trunk is supported by a six-inch rubber belt passing around the abdomen and fastened at the back of the chair; and a second wide belt is passed around the upper portion of the legs and again fastened securely at the back of the leg extension of the chair.



The method consists essentially in embedding in a plaster cast, that is applied to the patient's head, two steel disks, from the back of each of which projects a metal collar carrying an internal thread. These disks may be included in the plaster cast in any position desired; for trigeminal operations the author places one disk directly at the back of the head and the other on the side of the head opposite to the side of operation. Fixation is obtained by screwing a steel rod into the collar of each disk, and attaching it on extension pieces securely fastened to the chair. Universal joints, arranged on each extension piece, permit the head to be held rigidly in almost any position. A single two-inch gauze bandage should be applied to the head first and then a piece of motor tyre cut to the size and the shape desired is placed directly over the operation field. The plaster cast is then applied and the disks are incorporated in it. A window overlying the rubber sheet can now be cut out of the plaster, and, if quick-drying plaster is used, steel rods can be screwed into position and the head fixed within five to ten minutes of first applying the plaster. For satisfactory fixation the plaster should include the supraorbital margin anteriorly, pass backwards on either side immediately above the external auditory meatus, and finish well down on the base of the neck. No stability is lost when the window, which may include the lower margin of the cast on the side of the head, is cut out of the plaster. The final position in the chair is a very comfortable one, and a number of persons who have tried it experimentally have vouched for this fact. The whole body may be relaxed, and there is no feeling of strain or tension about the neck or head. Although the position is so stable, it is, nevertheless, quite flexible, since, if it is desired, the patient may be lowered immediately almost into the horizontal position simply by unlocking the ratchet and lowering the back of the chair. This arrangement is very desirable, as, even when local anaesthesia is used, patients are occasionally encountered who are intolerant of operation in the sitting position and who may exhibit quite sudden and alarming alterations in the pulse rate, respiration or state of consciousness. The patient may be rapidly removed from the head rest simply by extending the operation window by a linear incision in the plaster across the vertex of the head. The whole arrangement lends itself readily to adequate sterilization of the skin field simply by fixing in position round the cut edges of the plaster bordering the field of operation narrow strips of gauze bandage soaked in flexile collodion. This completely shuts off the operation field from the surrounding skin areas, and asepsis may be further assured by suturing or clamping the drapings round the margins of the window cut out of the cast. The cast may be applied either before or after induction of anaesthesia. The accompanying photographs show the details of the head-fixation pieces and demonstrate the final comfortable position of the patient ready for draping. The abdominal and leg belts are not shown. The upright rods fixed to the arms of the chair carry the instrument tray.



## Case Reports.

### FIBROMA OF THE TUNICA ALBUGINEA TESTIS.

By R. J. SILVERTON,  
Sydney,

AND

D. A. WELSH,  
Emeritus Professor of Pathology, University of Sydney.

#### CLINICAL REPORT.

(R. J. Silvertton.)

A HEALTHY young man, aged thirty years, was referred to me in October, 1934, by Dr. Basil Riley at the Royal North Shore Hospital, Sydney. For several days he had suffered from very severe pain, which had come on suddenly in the region of the left testis, radiating up to the left groin and the left side of the abdominal wall. There was no pyrexia nor vomiting, and there were no symptoms referable to the urinary tract.

On palpation it was possible to feel a small nodule, very tense and very tender, on the anterior aspect of the upper end of the left testis. As well as eliciting tenderness, pressure on the nodule caused pain to be referred up over the abdominal wall on the same side. The body of the testis itself was also tender on palpation, but not the spermatic cord. A plain radiogram was clear, and the urine contained scarce red blood cells and scarce leucocytes.

I made a tentative diagnosis of torsion of the *appendix testis*. Quite a number of these cases have been reported recently in the urological literature, and I thought that I might be able to add one to the list; but this did not eventuate, for at operation the *appendix testis* was present and quite normal. No *appendix epididymis* was present. The offending nodule was a small rounded tumour, partly projecting from and partly implanted in the visceral layer of the *tunica vaginalis* covering the upper and anterior portion of the testis (Figure 1). The nodule was dissected out carefully, and was found to be submerged about 0.5 centimetre in the testis, thinning out the *tunica albuginea* at this point. The raw area left after removal was sutured with plain catgut. The patient was immediately relieved of his pain and got on well after this.

As will be seen from Professor Welsh's report, the specimen was a fibroma with a loose, infected centre, the latter condition explaining the tenderness and pain.

#### PATHOLOGICAL DESCRIPTION.

(D. A. Welsh.)

The growth formed a rounded nodule about one centimetre in its longest diameter. Microscopic examination of a complete hemisection revealed the structure of a highly cellular fibroma, with great irregularity in the size and shape of the fibroblastic cells, and considerable variation in the stage of their fibroblastic development, but all densely packed together. The main mass of the growth formed a relatively wide peripheral zone having this compact fibrocellular structure and staining deeply.

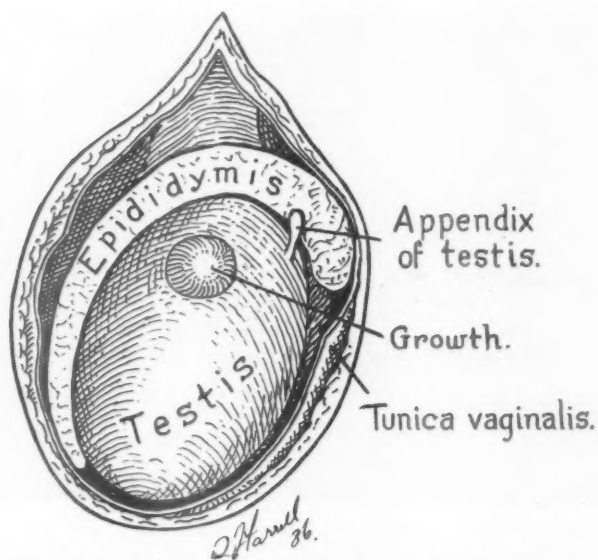


FIGURE I (natural size). Drawing to illustrate the relative size and anatomical relations of the growth (fibroma) from the *tunica albuginea testis*.



FIGURE II ( $\times 8$ ). Enlarged macroscopic view of a complete hemi-section of the fibroma, showing (a) central dark shadow of infected area, (b) intermediate lightly coloured loose oedematous zone, (c) peripheral darkly coloured compact fibroblastic zone, constituting the main mass of the newgrowth. The tag of malformed vascular tissue outside the true newgrowth is also seen.

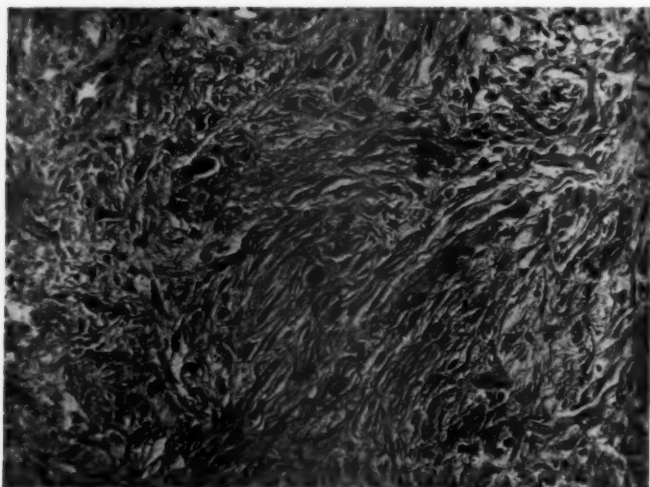


FIGURE III ( $\times 160$ ). Photomicrograph showing the peripheral zone and its compact fibrocellular structure, with its irregularity in size and shape of the fibroblastic cells and in their fibroblastic development (fibroblastoma).

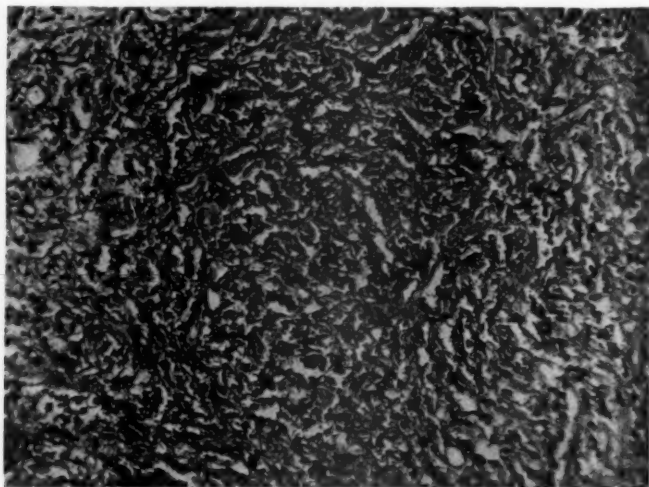


FIGURE IV ( $\times 160$ ). Photomicrograph showing the infected centre of the fibroma attracting numerous polymorphonuclear neutrophilic leucocytes whose nuclei are breaking up (karyorrhexis).

Within that peripheral mass there appeared an intermediate zone, probably associated with central degeneration and infection of the fibroma. Within that again, a small darkly staining central area was crowded with polymorphonuclear neutrophile leucocytes, whose nuclear chromatin was extensively broken up into minute irregular fragments (karyorrhexis), indicating that the degenerate centre had become a focus of pyogenic infection.

Having regard to the clinical history of pain, special attention was given to the possibility of the growth's being a neurofibroma. Special staining methods were not used, but there was nothing in the ordinary staining reactions to suggest a neurogenic origin; for example, there was no whorling of the fibrocellular structure. But neurofibroma is not excluded by these negative findings. Even in the cluster of vessels attached to the growth no nerves were found. The only explanation of the pain appeared to lie in the infected centre of the growth and the associated œdema.

A closely packed cluster of many abnormal vessels was attached to one pole of the growth. Most of these vessels were arteries with thick malformed muscular coats and irregular endothelial linings. Such arteries frequently form the starting point of a hæmangioma. Several dilated lymphatic vessels were found among these arteries, but few veins could be identified, and no nerves were seen.

## DERMOID CYST OF THE CEREBELLUM.

By I. DOUGLAS MILLER,  
*Sydney.*

INTRACRANIAL dermoids containing hair fall into the category of pathological rarities. In his vast experience Cushing recorded three instances and Dandy has recorded one. The following case is, therefore, of considerable interest both from a pathological point of view and because clinically it very closely resembled a cerebellar astrocytoma.



FIGURE I. Skiagram showing "ballooning" of the posterior fossa.

### Clinical History.

A well-developed girl, aged eleven years, was referred to me by Dr. Tansey, with a history of attacks of headache and of vomiting for nine months. These attacks commenced irregularly, usually when she was at school, and she had frequently to be sent home. The headache was frontal in position, and the vomiting was forcible and unaccompanied by nausea.

These attacks gradually became more frequent and so severe that after six months she was unable to attend school. At about this time she commenced to



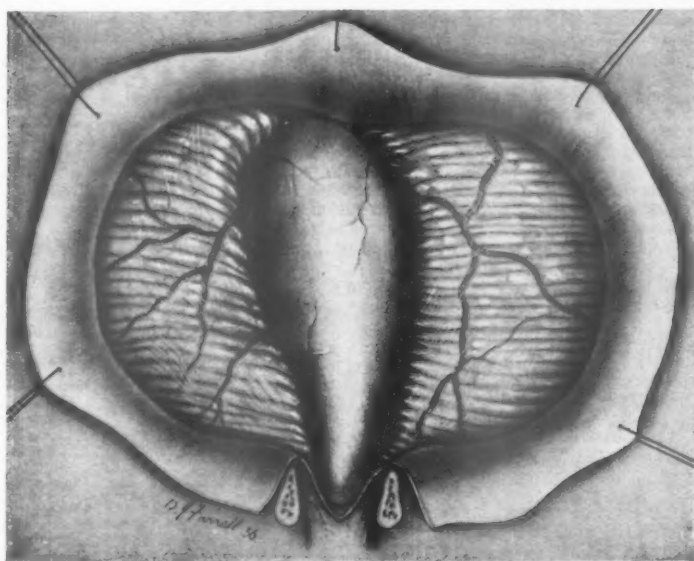


FIGURE II. Drawing made from surgeon's sketch of tumour.

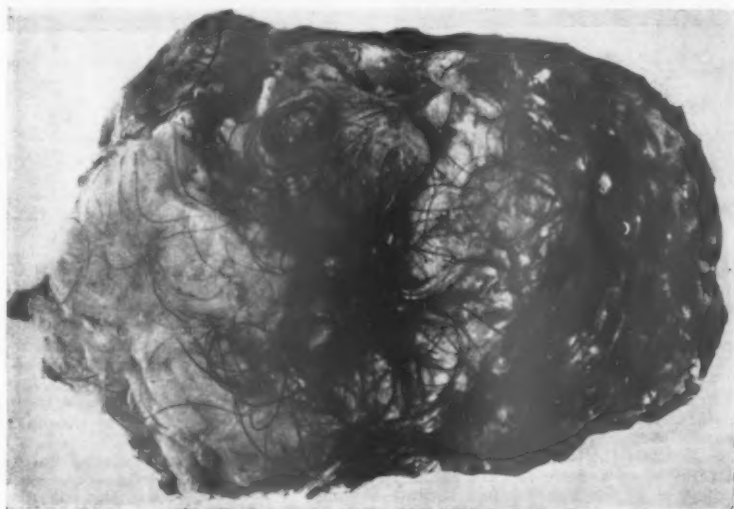


FIGURE III. Cyst containing hair.

complain of occipital headache. Though she remained an active and intelligent child, her parents noted that she was becoming quieter.

Three weeks prior to her admission to hospital she had become unsteady in her gait, reeling about in a drunken fashion, with a tendency to fall to the left. Her eyesight was not appreciably affected, though for a few months a slight squint had been noticed.

On examination she was a bright, intelligent child. There was a bilateral papilloedema; a doubtful weakness of the lower part of the right side of the face was present; marked hypotonia of the limbs was noted, with slight diminution of power of the left upper limb. The finger-nose tests were unsteady on the left side, and she had a well-marked left-sided rebound phenomenon, and some dysidiadochokinesis. All her tendon reflexes were exaggerated, and there was pronounced bilateral ankle and patellar clonus. There was a suggestion of



FIGURE IV. Post-operative photograph showing the characteristic attitude of head.



FIGURE V. Healed wound.

"cracked pot" sound on percussion of the skull. She walked very unsteadily on a broad base, with a tendency to fall to the left, and she carried her head thrust forward and inclined to the left.

X ray pictures of her skull revealed slight convolutional atrophy and a little separation of the sutures. There was a definite thinning and bulging of the left posterior fossa, making a most unusual appearance, explicable only on stereoscopy.

A diagnosis of cerebellar tumour was made. It was thought that this was primarily in the mid-line, extending out to the left, and it was hoped that an astrocytoma would be found.

At operation, under gas and oxygen anaesthesia, the cerebellum was displayed through the "cross bow" approach, and the floor of the posterior fossa, the posterior arch of the *foramen magnum* and of the atlas were removed. The bone of the left side of the posterior fossa was remarkably thin.

When the dura was opened, a large densely white tumour, about the size of a hen's egg, was found to be compressing the cerebellum in the mid-line, extending outwards into the left hemisphere, and to have extended downwards through the *foramen magnum*, thus obscuring the cerebellar tonsils.

A small incision was made into this tumour, and soapy material extruded. On removal of a little of this, some hair was found mixed with the contents and the nature of the tumour then became obvious. The contents had the consistency of cheese. It was emptied with a curette, and the cyst wall was gradually made to collapse and tilted out of its bed. A few small vessels running between it

and the cerebellum were coagulated. After removal, the tumour bed was found to be formed by compressed cerebellum, with a very large area of the tentorium constituting the upper limit of the cavity. Cerebro-spinal fluid now commenced to well up from below the compressed cerebellar tonsils. The large cavity was filled with Ringer's solution and the wound was closed. The child made a rapid recovery, and, on getting out of bed two weeks later, she had lost most of her signs and rapidly commenced to walk in a normal manner. She has since returned to school and to a full active life.

*Pathology.*—The cyst and its contents weighed over 60 grammes. There was a considerable amount of brown hair mixed throughout amorphous soapy material. Histological examination of this material failed to reveal any cell structure. A section taken from the wall of the cyst showed a layer of typical compressed squamous epithelium and numerous sebaceous glands.

#### Comment.

A century ago Cruveilhier described the *tumeurs perlées*, of which several instances have been recorded since. There has been considerable speculation as to the tissue of origin of these tumours, and it has generally been conceded that they arise from embryonic inclusions of epiblast. In appearance these tumours closely resemble pearls in their colour and sheen, and may occur almost anywhere within the skull. These tumours contain cholesterol, and are enclosed within a capsule consisting of various strata, but having no living cell structure.

The present case is in striking contrast to the pearly tumours. In appearance it was peculiarly flat white, rather parchment-like. There was a definite and complete envelope which was composed of well-developed stratified squamous epithelium. The contents were those typical of an epidermoid cyst.

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## SPONTANEOUS EVACUATION OF A HYDATID CYST OF THE LIVER BY WAY OF THE BILE DUCTS.<sup>1</sup>

By A. J. MASON,

*Superintendent of Ashburton Hospital, New Zealand.*

With a Comment by SIR LOUIS BARNETT,

*Hydatid Registrar, Hampden, New Zealand.*

### Clinical History.

(A. J. Mason.)

F.H., a SCHOOLGIRL, aged twelve years, was admitted to hospital on May 7, 1935. For six weeks she had felt out of sorts with abdominal discomfort and occasional diarrhoea, but no vomiting. Two days before her admission to hospital jaundice set in.

On examination, the girl was found to be moderately jaundiced, well nourished, with normal temperature and pulse, and complaining only of slight malaise. The liver was noted as being enlarged downwards to half-way between the ensiform cartilage and the umbilicus, but was smooth and firm and not tender.

X ray examination revealed a small bulge upwards in the centre of the right half of the dome of the diaphragm, suggestive of a cyst about the size of a tangerine orange. The complement fixation and the Casoni tests both gave strongly positive reactions. The eosinophile cells numbered 12% of the total white cells. The urine contained bile. The stools were pale in colour, but otherwise normal.

The routine investigation of this patient's condition was going on smoothly, when suddenly on the fourth day after her admission a dramatic change took place. At 6 a.m. on May 11, 1935, she was suddenly seized by intense colicky pain in the upper part of the abdomen, with vomiting and deepening of the jaundice. During the succeeding hours the pain became continuous, the temperature reached 38.9° C. (102° F.), the pulse rate was 130, the respirations numbered 30 in the minute; the abdomen became rigid and very tender, and the patient was obviously acutely ill. It was thought that she was suffering from a rupture and leakage of a hydatid cyst, and at 4 p.m. she was operated on.

The abdomen was opened by a right upper paramedian incision. The peritoneal cavity was free of fluid. The liver was greatly enlarged, smooth and mottled. No liver cyst was visible or palpable, but high up adhesions were noted between the dome of the liver and the diaphragm. The gall-bladder was about three times the normal size and tensely distended. The common bile duct, too, was greatly distended and especially swollen towards its lower end. By squeezing, milking and other manipulations, it was found that the contents of the gall-bladder and bile ducts could be completely evacuated into the duodenum. It looked as if there was now a free passage-way for the cyst to empty itself, and it was decided, therefore, to close the abdomen without further exploration of the liver; all the other abdominal organs seemed healthy.

About eight hours after the patient was returned to bed she vomited much bilious fluid and with it a thin-walled ruptured cyst, which appeared to have been about the size of a small tangerine orange. About twenty-four hours later her bowels acted, and the stools were normal in colour and contained small fragments of hydatid membrane.

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<sup>1</sup> From the Hydatid Registry.

Convalescence was uninterrupted, the jaundice disappeared, and the liver became of normal size.

Examination a year later revealed no signs of any recurrence, and X ray examination showed that the diaphragmatic bulge had quite disappeared.

#### Comment.

(L. E. Barnett.)

The above case, skilfully handled and carefully recorded by Dr. A. J. Mason for the Hydatid Registry, is of exceptional interest because under the very eye and hand of the surgeon the contents of a liver cyst were piloted along the bile ducts without incision, and the whole process of spontaneous evacuation and of cure was observed.

In the literature there are numerous references to hydatid cysts of the liver which have burst into bile ducts. It is, in fact, a very common complication (Dév ), perhaps the commonest complication of liver cysts (Dew); but evacuation of the cyst contents by this route is not usually complete, and is not usually unaccompanied by difficulties and dangers calling for operations in order to save life.

A few instances are recorded in which the clinical signs pointed clearly to the diagnosis of a liver cyst evacuated into the bowel by way of the bile ducts, followed by spontaneous cure. G. Duprey (pupil of D v ) states that this occurs in 24% of such cases (*Th se de Paris*, December, 1923).

In some of these cases the term cure is a misnomer, for the patient's recovery may be only temporary. The evacuation may not have been complete; scolices, fragments of membrane or daughter cysts may have been retained in the original cyst cavity, and later, after months or years, this cavity fills up again with secondary hydatid cysts and the patient is as bad as ever.

Dr. Mason's case is exceptional, and the cure is likely to be permanent, because, as usual in young subjects, the cyst was no doubt univesicular, thin walled and apparently evacuated *in toto*.

Hydatid cysts which undergo partial or complete evacuation by way of the bile ducts are not commonly situated, as might be expected, in the region of the portal fissure. The usual site, as D v  has pointed out, is high up in the right lobe of the liver, and here they grow silently and latently for many years; so that a hydatid cyst started, as is so often the case, in childhood, may cause no trouble until adult or middle or even old age is reached. In old cysts the walls are usually thick and more or less calcified; the contents are degenerated and bile stained, and daughter cysts are present. The openings eroded by pressure necrosis into bile ducts deep seated in the substance of the liver, are not as a rule adequate in size or suitably located for efficient drainage. Consequently evacuation is fractional and usually incomplete, and the recurring syndrome of biliary colic and jaundice leads all too frequently to the erroneous diagnosis of gall-stones. The error is revealed at operation, but not always, because the surgeon may note that the gall-bladder actually does contain gall-stones or in other ways looks abnormal, and he then contents himself with removing it. Sometimes, however, he notes a distension of the common duct. This he opens, and a surprise-package of hydatid cysts or degenerated membrane confronts him and gives him the clue to the correct diagnosis. Then he searches for, and may or may not find, the parent cyst which, as a rule, is deep seated and high up in the liver.

If he cannot locate the parent cyst, he opens, evacuates and drains the common duct, and hopes that this will suffice to bring about a cure. Exceptionally a cure does result with this treatment, but in most cases the parent cyst cannot empty itself properly by way of the bile ducts, and complications of various kinds cause serious trouble.

If in his abdominal search the surgeon does find the parent cyst, it should be evacuated and drained. It is really more important to drain the cyst directly than to drain the ducts. If the cyst cannot be reached from the abdominal

incision, the wound should be closed, after provision has been made for common duct drainage, and at a later date a transthoracic operation should be undertaken.

Transthoracic opening of hydatid cysts, even when done in two stages, is definitely more dangerous than the abdominal approach. The abdominal approach should be preferred whenever practicable, in spite of the difficulties arising from the location of the cyst high up under the diaphragm. A vertical incision through the lower costal cartilages near the sternum can be a very helpful aid in approaching and dealing with the cyst.

Dévé recommends the transthoracic approach whenever the cyst is in the region of the dome of the liver, but on this point, and with all due respect to this eminent authority, I venture to differ.

Dr. Mason's case shows how, in exceptional circumstances, the usual complications and difficulties to which I have referred may not occur.

## The Australian and New Zealand Journal of Surgery.

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All articles submitted for publication in this journal must be typewritten and double or treble spacing should be used. Each article should conclude with a brief summary and statement of conclusions. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without any abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal together with that of the journal in which the abstract has appeared, should be given, with full date in each instance.

When illustrations are required, good photographic prints on glossy gaslight paper should be submitted. Line drawings, charts, graphs and so forth should be drawn on thick white paper in India ink. Authors who are not accustomed to prepare drawings of this kind, are invited to seek the advice of the Editor if they are in any doubt as to the correct procedure. Skiagrams can be reproduced satisfactorily only if good prints or negatives are available.

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No. 1.

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### THE TWO JOURNALS OF SURGERY.

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THE surgeon, as we know him, is a product of quite modern times. Two generations ago the surgeon to a large hospital with a teaching school would attend a patient with pneumonia or advise as to the treatment of a patient with diphtheria or scarlet fever as readily as he would treat a scrofulous knee or a strangulated hernia. Listerism changed his whole outlook, and the progress of bacteriology taught him to confine himself to his own special branch of work. Operations increased in number and complexity, and he was no loser financially by the change. Robbed of most of its horrors, operative surgery attracted a better educated class of man, whilst the help of trained nurses relieved him of much drudgery and anxiety. He thus had time to think, to cultivate the literary side of his art, and to consider the more remote results of his work. Still later, he desired to advance surgery by the experimental method, which alone could tell him the reason for his successes and failures. Finally, many wished to know what had been done by their predecessors, and the history of surgery began to claim their attention. The increase in



the number of surgeons in the Empire and the multiplicity of their spheres of action led to the discovery that there was no publication devoted solely to their work. In 1913 a few surgeons met in London and determined to establish a periodical dealing entirely with the surgery of Great Britain and the dominions. The articles were to be original and were to be rigidly supervised by experts in the subject of which they treated before they were submitted for acceptance by an Editorial Committee. Illustrations were to be numerous and of artistic excellence. From time to time visits were to be paid to surgical clinics in Europe, and the impressions thus gained were to be published for the information of those who were unable to leave their own country. When *The British Journal of Surgery* was founded, the ideals aimed at were high, and there were some who said that the whole scheme was foredoomed to failure. But it was determined to "carry on" in spite of the prophets. A committee was chosen representative of Great Britain and Ireland and of the dominions. Lord Moynihan, then Sir Berkeley G. Moynihan, was elected Chairman; Mr. Hey Groves was elected Secretary and Editor; Messrs. John Wright and Sons, of Bristol, undertook the printing and publishing. The journal more than justified its existence, and on its twenty-first birthday it presented, as a thank offering, one thousand guineas to the Royal College of Surgeons for the furtherance of experimental research. Similar conditions arising somewhat later in New Zealand and Australia than in Great Britain, led to similar developments. Surgery rapidly became specialized, and has proved itself strong enough to establish a college of surgeons which has received royal recognition. The need for a special journal of surgery has been widely felt. THE AUSTRALIAN AND NEW ZEALAND JOURNAL OF SURGERY was founded, and its five volumes show how well the need has been met and how much good work would have been lost or scattered had there been no such journal. Its future should be as assured and as satisfactory as that of the British journal. The surgical output in Australia and New Zealand is of the highest quality, and it is of the greatest importance that a record of it should be kept in a form which is readily accessible.

D'ARCY POWER.

## Surgey in Other Countries.

[In this column will be published short résumés of articles likely to be of practical value from Journals published in other countries and not readily accessible to surgeons in Australia and New Zealand.]

### WOUND TREATMENT WITH CARBON DIOXIDE.

Professor Dr. R. Cobet, Rudolf Virchow-Krankenhaus, Berlin: "*Wundbehandlung mit Gasförmiger Kohlensäure*", *Der Chirurg*, July 15, 1936, page 549.

COBET, in his treatment, uses both the chemical effect of carbon dioxide gas, which diffuses through the skin, and by increasing acidity produces local dilator effects on the small vessels; and also the physical effects of alternate cooling and warming on the larger vessels. Cobet finds the treatment very valuable for wounds of poor healing capacity. Included in this class are empyema fistulæ (non-tuberculous), bedsores, burns and varicose ulcers, and also gangrene from deficient arterial circulation. He emphasizes the excellent healing results that may be obtained by simple gassing of large bedsores in paralysed patients and in slow-healing empyema fistulæ. In an endeavour to improve the action of carbon dioxide on the different forms of gangrene of the extremities, Cobet worked out a special technique to include both chemical and physical effects.

The skin temperature of a limb can be lowered by from 5° to 7° C. in a few minutes by cooling it in a box in which fluid carbon dioxide is allowed to evaporate. The gas then formed being heated by carbon filament lamps, an alternating warm and cool bath is achieved, which produces a reactive hyperæmia in addition to the chemical hyperæmia due to the gas itself. In devising an apparatus, great care must be taken to see that the fluid carbon dioxide does not come into any contact with the skin or grave blisters may result. The limb must be protected by some material, which itself must not be in contact with the skin, lest, being soaked with sweat, it becomes frozen and transmits the freezing action to the skin itself. This danger is particularly present in the toes. A simple electric light cabinet can be used for the purpose, the leg being covered with cellulose or wool. The carbon dioxide is drawn off from an inverted cylinder through a wide tube with no reducing valve. If the carbon dioxide stream impinges on the electric globes they will immediately burst. Unfortunately, with such a simple apparatus there is always the opening for some lack of care on the part of attendants, and carbon dioxide burns may result; the special cabinet such as Cobet describes is better. It is constructed as follows.

A long sleeve-shaped box with a hinged lid contains in a side compartment the heating apparatus, either carbon filament lamps or, better, a wire resistance. The limb rests on leather slings in this box, and is surrounded by protective material which is fixed at such a distance from the slings that it does not come in contact anywhere with the skin. The space in which the limb lies is closed by a tie fastening some distance away up the thigh, the main space being closed in at the edge of the box. A thermometer is placed between the protective layer and the box wall, so that the temperature of the gas which will occupy this space may be read. When the limb is in position the air in the case is warmed to 40° C. for some fifteen minutes. Liquid carbon dioxide is then run in, as described, into a loose tin container between the protective covering and the wall of the case, for half to one minute. After evaporation, the gas is warmed to 40° C. for fifteen minutes. This process may be twice repeated, and the apparatus is again warmed, and the limb bathed in carbon dioxide for half to three-quarters of an hour. At first a daily treatment is given in bad cases. Later treatment is given at longer

intervals. It is often wise to order a soap and water wash before treatment, to remove scabs and crusts, and to make the skin more readily permeable to the gas. A temperature of higher than 40° C. should be avoided, as experience shows that patients with a tendency to gangrene do not tolerate dry heat at all well.

All kinds of gangrene of the extremities are suitable for this treatment if they are not too extensive, or so badly infected as to threaten life. Following it, the patients have a pleasant sense of warmth for some hours, or even into the next day. The pain that accompanies the condition disappears swiftly, and morphine is rendered unnecessary. Gangrene becomes demarcated more quickly, and those parts which are going to be conserved show a rosy appearance. Dead tissues slough off. Vigorous granulation occurs on the wound surfaces, and epithelialization proceeds swiftly.

Patients may need twenty or thirty treatments, but providing that the main circulation has not been eliminated, as in embolism, good results may be expected.

ARTHUR E. BROWN.

#### HYDATID DISEASE.

*Archivos internacionales de la hidatidosis* is a journal edited by Dr. Velarde Perez Fontana, Professor of Surgical Pathology of the University of Montevideo, and published by the Health Department of the Republic of Uruguay.

THE second fasciculus of the first volume of this journal (dated December, 1935), which is devoted entirely to the subject of hydatid disease, recently reached us, and we congratulate all concerned on another interesting and useful contribution to hydatid literature. Abstracts from the first fasciculus have been previously published in *THE AUSTRALIAN AND NEW ZEALAND JOURNAL OF SURGERY*, January, 1936.

A. The most instructive features of this issue are the two papers (in French) by Gaston Lemaire, Director of the Health Service of Algiers, one on "Experimental Biology", pages 281 to 290, and the other on "The Laboratory Tests", pages 291 to 300.

1. *Biology*.—Lemaire has followed up his researches on scolliculture, using a somewhat similar technique to that adopted by Coutelen. A small test tube containing aseptic hydatid fluid and fertile scolices is sealed off with a collodion film, which acts as an ultra-filter, and is then immersed for as long as is desired in another and larger tube containing the renewable nutrient medium.

Lemaire finds that hydatid fluid varies considerably in different circumstances and in accordance with the organ and the animal from which it is obtained, and with the condition of the parasitic membranes, which, in normal conditions, play such an important part in osmotic regulation.

He found cholesterol absent from 27% of specimens examined and inositol absent from 19%. Traces of lecithin and of ammonium nitrate were constant. A proteolytic ferment proportionate to the albumin content and glycolytic ferment proportionate to the glucose content are both present. If typical hydatid fluid is introduced experimentally into a vein, the effects of two different substances are superimposed—a toxic poisoning and a peptoid shock.

All fertile and normal cysts contain, in the hydatid fluid, more or less albumin, and this originates from the parasites themselves, possibly by action of the vibratile excretory cells (flame cells) of the scolices. The typical cyst with intact membranes in a human being allows only the exosmosis of toxins in small amount. In multiple infestation with cysts there may be so much absorbed as to lead to a condition of hydatid cachexia. When the membranes are abnormal, degenerated, fissured, punctured or opened by injury or operation, foreign albumin escapes into the tissues and produces its inoculation effects.

Based on these observations, Lemaire draws interesting conclusions regarding allergic and anaphylactic manifestations.

2. *Laboratory Diagnosis*.—Lemaire's ideas on laboratory diagnosis may be thus summarized.

The melostagmin reaction, which indicates a lowering of surface tension, as shown by Ascoli's stalagmometer when hydatid antigen and the patient's serum are combined, is condemned as inconvenient and unreliable.

Eosinophilia is noted in only about 50% of cases, and many other diseases besides hydatid produce a rise; but Lemaire thinks that multiple, complicated, fissured, ruptured and infected cysts always cause eosinophilia of 5% or more. Its absence in a definite case of hydatid infection suggests that the cyst is in a state of quiescence.

The precipitin reaction in which a flocculent precipitate results from mixture of the patient's serum and hydatid fluid, is doubtfully specific and not so reliable or so useful as the complement fixation.

Fixation of complement. The author stresses the importance of standardization by titration of the antigen used, and in his opinion the albumin content should also be investigated. The value of this test is very variously estimated by different observers as from 90% or more down to 25% or less, and Lemaire ascribes the discrepancy to the well-known pathological variations in the condition of the hydatid membranes and their permeability to albumins. He thinks traumatically damaged, degenerating or suppurating cysts (provided the suppuration is not more than a few months' duration) are always associated with positive complement fixation.

The passive allergy skin reaction of Prausnitz-Küstner is obtained by injecting into the skin of the forearm of a healthy person a minute quantity of the patient's serum, and then into the same place a trace of hydatid antigen. An anaphylactic skin reaction results in positive cases, and this may be seen even when the complement fixation test fails. Much more convenient and useful, however, is the generally employed Casoni skin test.

The Casoni test should always be supplemented by a control inoculation of peptone into the skin of the opposite forearm in order to avoid errors due to hypersensitization idiosyncrasy. The results on the whole are very reliable, but youthfulness of the cyst, cachexia, hypersensitization and anaphylactic shock may all prevent the reaction from occurring, and there are some who maintain that the reaction is a general cestode one and not specific for the *Tania echinococcus*.

**B. Hydatid Pneumothorax and Secondary Pleural Invasion.**—C. Victor Armand Ugon, of Montevideo, contributes (in Spanish) a long paper on hydatid pneumothorax and secondary pleural invasion (pages 143 to 226). He describes sixteen cases hitherto unpublished, and brings up to date incomprehensive and beautifully illustrated fashion our knowledge of this uncommon complication. The author draws largely on the classic paper of Dévé, of Rouen, published in 1925 in the *Revue de Chirurgie*, Volume lxiii, pages 245 to 295. Barnett's paper in *The British Journal of Surgery*, Volume xix, Number 76 (1932), has escaped his notice. A special point is made of the frequent and erroneous diagnosis of this condition as tuberculosis, and the author also makes the statement that in 80% of cases of hydatid pneumothorax there was no previous recognition of the presence of a hydatid cyst.

**C. Pulmonary Hydatid Cysts.**—A clinico-bronchographic study (in Spanish) of the different forms of pulmonary hydatid cysts, by Raul Piaggio Blanco and Frederico Garcia Capurro, of Montevideo, occupies pages 227 to 266. This is an elaborate, richly illustrated and informative study of the various pathological modalities of pulmonary hydatids as revealed by lipiodol plus X rays.

**D. Hydatid Cyst of Liver Opening into the Inferior Vena Cava.**—Hector Castiglioni Alonso, of Montevideo, reports (in Spanish) a hydatid cyst of the liver opening into the inferior vena cava. The following is a précis of the case described. J.S.B., aged twenty-six years, suffered for forty days before his admission to hospital from chest troubles, pain, cough and hæmoptysis, and from fever and emaciation. He became acutely ill and died four days after admission. *Post mortem* examination revealed a large multilocular cyst in the dome of the liver opening widely into the vena cava. Daughter cysts were noted in the right side of the heart and in the pulmonary arteries. The article is illustrated with nine photographs, and interesting information is given regarding other similar cases published in various British and foreign journals.

*E. The Centre for the Study and Prevention of Hydatid Disease in Uruguay.*—The centre for the study and prevention of hydatid disease in Uruguay, headed by Dr. Fontana, has continued its efforts to reduce the alarming prevalence of this parasitic menace, and investigations are reported regarding the contamination of foodstuffs open to pollution by dogs and by flies, the number and location of dogs, sheep, oxen and pigs found infected, the difficulties in obtaining government support, and so on. Dr. Fontana is full of enthusiasm, but he has a hard row to hoe.

L. E. BARNETT.

#### A TECHNIQUE FOR DISPLAYING THE ODONTOID PROCESS ON X RAY FILMS.

**Dr. E. Knirsch, Vienna:** "*Eine Hilfsmethode zur röntgenologischen Darstellung des Dens epistrophei*", *Der Chirurg*, September 1, 1936.

DR. KNIRSCH describes the method he uses, in combination with other positions, for obtaining an excellent view of the odontoid process, including its origin from the axis, and also a complete survey of the atlas, with its transverse processes and their foramina. The method also has the advantage of utilizing the natural position taken up by the patient after injuries in this region, and of avoiding painful movements and adjustments.

The patient sits at a small table, and rests his chin and neck on an inclined cassette, the upper border of his sternum resting against its edge, as shown in the illustration (Figure



FIGURE I.



FIGURE II.

I). The tube is set so that the focal ray passes along a line drawn from a point in the mid-line of the skull a hand's breadth above the external occipital protuberance, to the hyoid.

Figure II illustrates the view obtained by this technique of the parts concerned.

ARTHUR E. BROWN.

## Reviews.

### SURGERY FOR POST-GRADUATES.

**Post-Graduate Surgery.** Edited by RODNEY MAINGOT, F.R.C.S.; Volume II; 1936. London: Medical Publications Limited. Sydney: Angus and Robertson Limited. Super royal 8vo, pp. 1825, with 1134 figures in the text. Price: £3 3s. for one volume, complete set £9 9s. (the volumes are not sold separately).

THE second volume of Maingot's "Post-Graduate Surgery" fully maintains the standard set by its predecessor, which is to be expected when so many of the same contributors appear.

The head, spinal column and salivary glands are dealt with by C. P. G. Wakeley in a concise manner, with clear details of treatment and technique. Wheeler's section on the neck, and particularly on the thyroid gland, gives a good modern account of technique, but rather skims over the theory, which is perhaps wise, considering our lack of knowledge of this subject. We do not agree, however, that Lugol's solution should not be given to patients with the adenomatous type of goitre. We are glad to see that Wheeler recommends division of the *scalenus anticus* muscle for a cervical rib syndrome instead of the operation of removal of the rib.

The thoracic section, by R. S. Johnson and T. H. Sellors, is of outstanding merit, and includes a description of the technique of Trendelenburg's operation for pulmonary embolism. There are five hundred pages on gynaecological diagnosis and technique, and the section is well illustrated and described by J. L. Cameron. A special section on sterility is written by S. Forsdike, but it contains no information on the important subject of ovarian hormones—surely an omission in a book of this nature.

J. C. Ainsworth Davis writes the genito-urinary section, and gives a complete method of routine examination and investigation; but the pathology of renal diseases is rather briefly written. The management of urinary calculus is well described, with a due regard for conservatism. Prostatic disease is a very well written section, and the various methods of treatment are given, with good details of technique, after-treatment and complications.

Abel has produced a very readable account of the anatomy, physiology and treatment of the sympathetic nervous system. Palliative as well as surgical treatment is stressed. Broster and Vines give the most complete account of the adrenal gland that we have seen published in any textbook.

Injection treatments are given with full details of technique and difficulties, including the injection treatment of hernia.

Bailey's section on infections of the hand is well written and illustrated.

Orthopaedics, by Buxton, is only partly dealt with in this volume, but the arrangement is not very satisfactory, and there seem to be many omissions in the sections described; these will, no doubt, be contained in the third volume, but it will make reference rather confusing.

### PSYCHIATRY.

**Theory and Practice of Psychiatry.** By W. S. SADLER, M.D.; 1936. St. Louis: The C. V. Mosby Company. Super royal 8vo, pp. 1253. Price: \$10.00 net.

DR. W. S. SADLER'S book is a rather monumental work of over twelve hundred pages, written with the purpose of giving both the medical and allied professions



a comprehensive review of modern psychiatric thought. Stress is laid on the minor maladies and personality deficiencies which occur in general practice, rather than the psychoses which need institutional care. The author is fortunate in being at the head of an institute where all diagnostic facilities are apparently at hand, and throughout the book the importance of thorough bodily examination and treatment receives emphasis, though it is shown that in the majority of cases defects found and treated in this way are of secondary importance to the psychological factors. Cases are quoted showing the disastrous effects which may arise from a neglect of such psychological factors by the enthusiastic physician and surgeon. This neglect leads to unnecessary operative measures with increased invalidism, as well as to the streams of dissatisfied patients who flock to Christian Science practitioners, osteopaths, faith healers, herbalists and such-like, to receive help which could and should have been given within the medical profession. The monetary loss this entails is mentioned, but even more than this is the discredit which attaches to the profession.

The need for more intensive study of psychiatry in the medical curriculum is emphasized, and the American recommendations for psychiatric education are given. This places psychiatry as one of the fundamentals of every medical man's knowledge and not merely a speciality; training commences in first year with a course in psychobiology, that is, a study of the normal functioning of the individual as a person.

The book is comprehensive in plan, embracing a summary of philosophic theories, both ancient and modern, as well as of modern psychiatric schools of thought. Amongst these the author finds his way with skill and understanding, and from them he apparently chooses theories which seem best to fit each case.

There is a section dealing with personality problems, which includes consideration of the growth of personality in the nursery, pre-school and adolescent years, the problems arising at these periods, and their importance for future development. The classification presented of the neuroses differs from that generally accepted, and includes such groups as states of inhibition and mild depression, which are not generally included amongst the neuroses. The great difficulties in the way of placing neurotic patients in any one class are admitted, and it seems that the classification presented does nothing to make this task easier.

The sexual neuroses are discussed with sympathy and understanding; but the view that homosexuality, or homo-erotism, as the author prefers to call it, is so inherently determined by glandular make-up that one need have no worry about subjecting an adolescent boy to the companionship of an adult homo-erotic unless he shows signs by giving of costly presents that he is trying to make him a homo-erotic prostitute, seems open to criticism.

The section devoted to therapy is lengthy and interesting mainly for the emphasis placed on reeducation and training, and the fact that the author's patients are, if possible, given a definite course of reading which must be carried out, and from which they are encouraged to make a diagnosis as to the causative factors at work in their own cases. This is presented as a graduating thesis and this is taken as a sign of cure. The rôle of religion as a therapeutic asset and liability is discussed, and rest and occupation each receives consideration.

Physical treatment is not neglected, but the author emphasizes that the vast majority of his patients receive no physical treatment whatever. An eloquent plea is made on behalf of the much-operated-upon neurotic who, "every movable organ having been fixed and every fixed organ rendered movable", still wanders on in search of a panacea for all her ills in yet another operation. William Mayo is quoted as stating that if nothing can be done to stop surgeons from operating on neurasthenics, there should be some legal enactment which would provide a "closed season" for them for three or four months in the summer, so that they should at least have the same protection as is extended to birds and other wild game.

In a work with a scope and originality such as this undoubtedly has, there is inevitably room for disagreement on many points, but for the general aim of the book there can be nothing but praise. It seems that the size of the volume



will tend to inhibit the casual inquirer, and it is possible that some condensation and simplification of classification might have led to a wider circle of readers. It is, however, very well set up, has a very inclusive index, and should prove of considerable value as a work of reference. Once referred to, there is a freshness in the attitudes adopted and the language in which these are presented that leads to further reading.

## A TEXTBOOK OF PATHOLOGY.

**A Text Book of Pathology.** By W. G. MacCALLUM, Professor of Pathology and Bacteriology, Johns Hopkins University School of Medicine; 1936. Philadelphia: W. B. Saunders Company. Melbourne: W. Ramsay (Surgical) Proprietary Limited. Royal 8vo, pp. 1277, with 697 illustrations. Price: 52s. 6d. net.

Six editions in twenty years have shown that the readers of MacCallum have appreciated the unusual method of exposition employed. The researches that the author has carried out, both before and after publication, indicate a desire to add to morbid anatomy the physiological background which converts the outlook on pathology from cold description of abnormal organs to an understanding of the alterations from normal function that were associated with this abnormality while the cadaver yet lived. The textbook brings this point of view to the whole range of the subject. That the newness of this viewpoint does not now surprise us must be attributed to the great influence which the earlier editions have had by directing the mental attitude of those engaged in pathological research and teaching.

This personal attitude of mind unfolds itself in a logical sequence. First the author deals with the reaction of the cells of the body to alterations in quality and quantity of the fluids of their environment, and then with abnormalities of the metabolism of the cells. There follows a consideration of the defensive and reparative processes of which the tissues are capable; as a sequence to this phase of the unfolding of tissue potentialities there is a detailed account of the reactions that develop when each of a comprehensive series of injurious agents affects the body. A valuable addition to the series in the present volume is an adequate description of the more common filtrable pathogenic viruses.

In that abnormalities of function of the endocrine glands and vitamin deficiencies affect both the structure and function of diverse tissues, these have each received consideration in separate sections of the book. After inclusion of diseases of which the aetiology is unknown, there is a general description of tumours.

To each section is a small bibliography of the subject, which is used very effectively to minimize the amount of space given to discussion of rare diseases.

The treatment of the subject achieves the author's apparent purpose—the teaching of correlation of abnormalities of structure and function. The book is a mine of detailed information, but the ore has been processed, and each stage of the operations is clearly shown. There can be no doubt that the reader will remember more about these processes and the raw material, because of their simultaneous presentation, than he would had they been demonstrated each at different times.

That this edition has been entirely reset does not indicate that it has been entirely rewritten. Here and there one finds anachronisms which do not tally with present knowledge or even with other parts of the book. For example, on page 186 we read: "Very vague, too, are our notions about the substances which cause tissue changes at puberty and especially those which produce the remarkable changes in the breasts and other organs in pregnancy. Doubtless these are chemical substances. . . ." The inclusion of benign giant cell tumour of bone as a sarcoma, though qualified, is misleading, as is the heading, "Tumors of Adrenal Origin (Hypernephroma)". There is, too, a tendency to adhere to the

conception of the nature of tissues as fixed; for example, the view is expressed that essentially bone can be formed from the cells of the periosteum and endosteum only. In a book of this nature, in which cellular processes and structural changes are the basis of the discussion, it is rather strange that there is no adequate reference to the work of that school (represented by Spemann and Needham) which has so brilliantly elucidated the chemical control of many processes of cellular differentiation.

These, however, are minor considerations when it is realized that the book presents a remarkably sustained and logical analysis of the subject-matter of pathology.

## ENDOCRINOLOGY.

**Endocrinology in Modern Practice.** By W. WOLF, M.D., M.S., Ph.D.; 1936. Philadelphia: W. B. Saunders Company. Melbourne: W. Ramsay (Surgical) Proprietary Limited. Royal 8vo, pp. 1018, with illustrations. Price: 63s. net.

"ENDOCRINOLOGY IN MODERN PRACTICE" is a recent addition to the already voluminous literature of the endocrine system. The work is very comprehensive and is mainly a compendium of our modern knowledge of this large subject. It deals primarily with the clinical side, and omits most of the purely theoretical aspects. The book is typically American, well produced, though not so well illustrated as it might be; it contains a wealth of information, some of which, however, rests on rather insecure foundations.

An interesting feature is a tabular scheme at the end of each chapter, in which the possible causes of specific symptoms are grouped together. This tabulation has its value in differential diagnosis when quick information is required. The work would have been much enhanced, however, had it contained a bibliography of standard contributions at the end of each chapter. As it now appears, there are no such references given throughout the whole work. As is to be expected, the amount of detail given on such subjects as the pituitary, the thyroid and the gonads takes up many pages, and it is sometimes difficult to see the wood for the trees. The clinical side, however, is well done, and there are special chapters dealing with such problems as the rarer hormones which have been described or suspected, obesity, and allied metabolic subjects.

The chapters on the pituitary and the parathyroid are particularly full and interesting; that on obesity is somewhat disappointing; but those dealing with menstruation, pregnancy and the menopause are packed with information. A special and valuable feature is the setting aside of several chapters to deal with the endocrine aspects of non-endocrine diseases. In these the writer, although admitting that in some cases there would seem to be only casual relationship with the endocrines, sets forth his beliefs in the importance of the effect of endocrines in orthopaedics, paediatrics, nervous and mental diseases, gastro-intestinal disorders, and in diseases of practically every other system. While there is in this chapter much that is suggestive, and some that is valuable, it would seem that in his enthusiasm the author has attempted to implicate these glands rather too much. However this may be, these chapters are among the most stimulating in the whole work.

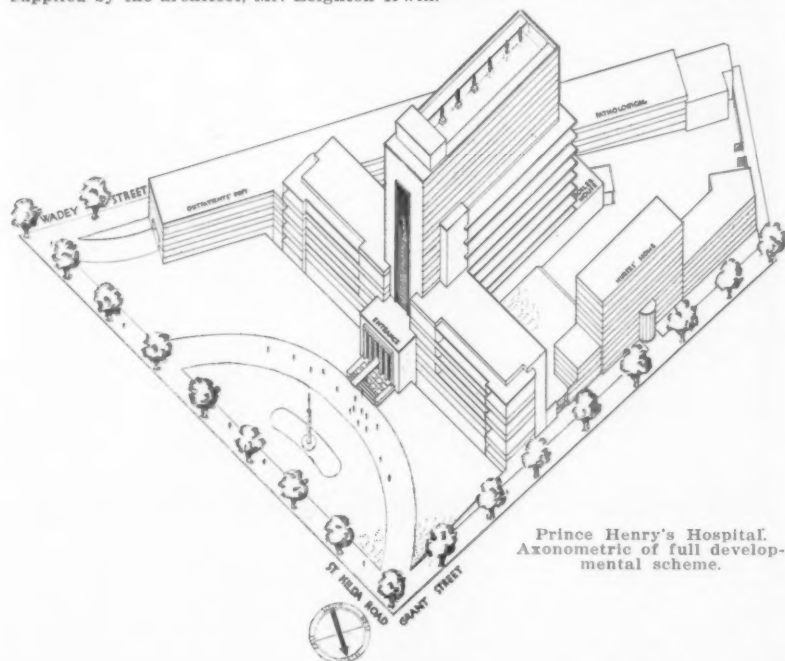
There is a unique chapter on bone development and its importance in assessing the influence of the various internal secretions. The final pages deal with the interpretation of laboratory findings, the choice of diagnostic procedures and diagnosis of main symptoms. The last-mentioned section is a sort of tabular compendium of symptoms which, though not very attractive, may prove to be of real value.

The book, then, has no claim to any originality; there is nothing really new in its subject-matter; but it does contain a huge mass of detail culled from an extensive literature, and it contains much useful tabular matter and some suggestive chapters. It is a book which practitioners and consultants should find very valuable for reference purposes.

## Proceedings of the Royal Australasian College of Surgeons

### POST-GRADUATE SCHOOL AT PRINCE HENRY'S HOSPITAL, MELBOURNE.

THE following information concerning the new Prince Henry's Hospital, Melbourne, at which the College Post-Graduate School of Surgery will be established, has been supplied by the architect, Mr. Leighton Irwin.



Prince Henry's Hospital.  
Axonometric of full develop-  
mental scheme.

The central block of the new building is planned to surround the patient with the utmost in safeguards that hospital engineering has devised. It will provide the environment without which the skilful work of the surgeon is unavailing.

In addition to the new casualty and pathological block now nearing completion, which contains two full-sized theatres and plaster room, a complete floor



action. In this bay there will be a telephone arranged with a headpiece which may be operated by the surgeon without manual contact.

The operating rooms will be of a pleasant grey-green tint, tiled up to the height of the steel door trim, and fitted with time and second clocks, an X ray viewing cabinet and various electric plugs of the non-sparking type. The floors will be of non-slip terrazo cut up into squares, with an inset metal grid, to which the tables and various electrical apparatus may be grounded.

The theatres are all to be completely air-conditioned by a special process whereby air entering is strained and then "scrubbed" in water. It will be drawn through a spray of filtered water by powerful fans, and in the process every organism will be removed. Entering at a point 100 feet above the ground, the air, after passing through the washer, will be warmed by steam coils or refrigerated, as the case demands. Following this process, it will be circulated through the rooms by ducts, entering and being discharged through grilles so as to travel through completely without causing draughts of any kind.

The temperature will be automatically controlled to remain at 73° F., and the relative humidity maintained at 60%.

## THE HYDATID REGISTRY.

The following is the annual report of the Hydatid Registry of the Royal Australasian College of Surgeons for the year ending December 31, 1936, submitted by the Registrar-in-Chief, Sir Louis Barnett:

I have now on file and duly indexed well over one thousand records of hydatid cases. A brief précis has been made on card index forms of each case recorded. In the near future these records, with the small cabinets containing them, will be deposited in the College library for reference purposes. I have also collected some hundreds of rather scrappy records of Australian and New Zealand cases, too meagre in detail to justify inclusion in the Registry forms, but of considerable value nevertheless.

It must be borne in mind that the cases recorded in the Hydatid Registry include an unduly large proportion of the more unusual and the more difficult types, and percentage conclusions should be evaluated accordingly.

The following table represents the location and mortality of 1,024 of the cases recorded in the Registry:

Location of Cyst.	Number of Cases.	Number of Deaths.
Liver .. .. .	616	80
Peritoneal, mostly multiple and secondary to liver cysts and including pelvic cysts .. .. .	81	16
Lung .. .. .	204	17
Muscles and fascia .. .. .	48	2
Bone, including spine .. .. .	30	4
Kidney .. .. .	27	6
Brain .. .. .	6	2
Spleen .. .. .	5	1
Thyroid .. .. .	2	
Heart .. .. .	1	
Breast .. .. .	1	
Parotid .. .. .	1	
Pancreas .. .. .	1	
Total .. .. .	1,024	128

Note.—The death rate here recorded is fallacious. It should be more like 15% or 16%. Many patients die in their own homes, and their deaths are not recorded in hospital case notes.

A notable addition to the total this year is largely due to a piece of collective investigation on "Calcification in Hydatid Cysts", made by Mr. Basil Kilvington, who studied the Melbourne Hospital records of 200 or more hydatid cases, and kindly supplied me with brief clinical notes of them.

With the valuable help of Mr. G. R. A. Syme, Mr. Julian Smith, junior, and particularly Mr. H. G. Wheeler, our indefatigable College Secretary, these Melbourne case notes are being amplified and made more adequate for the purposes of the Registry.

Another piece of good fortune in adding to the number of our hydatid records I owe to Dr. J. L. Kneebone, of Hamilton, Victoria, who recently sent me an interesting and instructive series of 35 cases from his own practice, and who has promised to send more when he can find time to transcribe them.

Mr. T. F. Ryan, of Melbourne, in a recent letter, gave me the welcome intimation that he, too, was going through the notes of his extensive series of hydatid cases, and would soon send me a large number of records.

The harvest from New South Wales this year has not been so good as usual. Professor Dew has sent a few cases and has tried to stimulate others to do likewise.

Dr. S. H. Lovell, of Sydney, a hydatid enthusiast, tells me that he is collecting hospital records for me and these, I hope, will soon come along.

I miss the frequent records I used to get from Dr. George Bell, Dr. Edye, Dr. Poate, Dr. Aspinall and other Sydney men.

The local registrars in New Zealand, Dr. Fitzsimons (Auckland), Dr. David Whyte (Wellington) and Dr. Fulton (Dunedin), have all been very kind and helpful; but Dr. L. A. Bennett, of Christchurch, is now too busy in other ways to give attention to the Registry work, and I have, therefore, arranged for Dr. W. McK. Dickson to undertake the duties of local registrar in that district. I am grateful to Dr. Bennett for his past valuable service, and hope still to have his cooperation. Professor Dew (Sydney) and Dr. Ian Hamilton (Adelaide) have shown keen interest in the work; but I regret to say that I have had no communication from Dr. T. Giblin (Hobart) nor from Dr. J. B. Turner (Melbourne).

To all surgeons and physicians, juniors as well as seniors, who have sent in records of cases, I tender, on behalf of the College, thanks for, and appreciation of, their services.

During the year Dr. R. Campbell Begg, of Wellington, published two papers on "Renal Hydatids", and expressed his indebtedness to the Registry for data supplied.

Dr. K. Christie, of Wanganui, is using Registry material in the preparation of a paper on "Bilateral Pulmonary Hydatids", and I myself have made use of the Registry records in compiling a paper on "Hydatid Cysts of the Dome of the Liver and their Special Dangers".

It may also be worth mentioning that in September of this year I received a letter from Dr. Hilliard E. Miller, of New Orleans, asking for any information that the Registry might be able to give regarding primary echinococcal cysts of the uterus, as he had a case which he judged to be in that category.

I was able to give him notes of the one and only indubitable primary uterine cyst at present in the Registry; and I told him of three other cases in which the uterus was deeply invaded by hydatid cysts, that were in all probability secondary to a primary liver cyst that had ruptured or leaked into the peritoneal cavity.

It is a matter for regret that, owing no doubt to lack of supervision by the senior surgeons concerned, many of the records are poor in quality, the diagnostic data being incomplete, the operative procedures not clearly described, the blank diagram forms not made use of, and follow-up notes conspicuous by their absence. The College is endeavouring to improve the standard of case taking generally, and I have good hopes that the second thousand records of hydatid disease will be better taken out by house surgeons and others than the first.

I again appeal to all Fellows to take an interest in this important piece of collective investigation. Australia and New Zealand are the only English-speaking countries where hydatid disease is at all common, and it is our duty to try to add to the world's knowledge of this remarkable malady, which is so full of fascinating problems for research.

Hampden, Otago, New Zealand.  
December 14, 1936.

L. E. BARNETT,  
Hydatid Registrar.



## VICTORIAN PROGRAMME FOR 1937.

THE Victorian State Committee held a half-day meeting at Saint Vincent's Hospital, Melbourne, on the afternoon of Friday, June 4, 1937. The following operations were performed.

- Mr. J. F. Mackenzie: Operations for osteoarthritis.  
Mr. C. Gordon Shaw: Plastic operation on hand (post-traumatic); plastic operation on *flexor longus pollicis* tendon.  
Mr. Leo Doyle: Thoracoplasty.  
Mr. J. Newman Morris: Cholecystectomy under "Pentothal" anaesthesia.  
Mr. F. J. Colahan: Varied operations.  
Mr. R. F. O'Sullivan: Vaginal plastic operation.  
Dr. John Horan: Demonstration of the use of the gastroscope, with cases.

In addition to this fixture, the following programme has been arranged:

Wednesday and Thursday, September 1 and 2, 1937:

The annual meeting at the Royal Melbourne Hospital.

On the evening of Thursday, September 2, 1937, Professor G. Grey Turner will deliver the annual lecture at the College, his subject being "Some Aspects of Œsophageal Surgery".

Friday, November 5, 1937:

A half-day meeting will be held at the Alfred Hospital, Melbourne.

## SECOND HAMILTON RUSSELL MEMORIAL LECTURE.

THE second Hamilton Russell Memorial Lecture, founded in memory of the first Censor-in-Chief, the late Robert Hamilton Russell, was held at the College on the evening of Friday, May 28, 1937. Professor Sir C. Stanton Hicks, Professor of Physiology of the University of Adelaide, delivered the lecture, taking as his subject "The Physiology of Acute Circulatory Failure due to Hæmorrhage and Shock". The lecture was attended by Fellows of the College, members of the British Medical Association and sixth year medical students.

At the conclusion of the lecture, medals for the Michael and J. P. Ryan Scholarships in Surgery for 1936 were presented to the winners of the scholarships, namely, Dr. J. F. Hughes and Dr. Yrsa Osborne.

These scholarships were founded by T. F. Ryan in memory of his father, the late Michael Ryan, and his eldest brother, the late J. P. Ryan.

## NEW SOUTH WALES EVENING MEETING.

AN evening meeting, arranged by the New South Wales State Committee, was held in the Robert H. Todd Assembly Hall, British Medical Association House, on Wednesday, June 30, 1937. The subject for the discussion was: "The Diagnosis and Treatment of Neuralgias of the Head and Face." The opening speakers discussed the subject under the following headings:

- Mr. A. B. K. Watkins: "Neuralgias Associated with Sinus Disease."  
Mr. I. D. Miller: "*Tic Douloureux*."  
Mr. R. A. Money: "Other Neuralgias of Cranial and Cervical Origin."



## **Notices.**

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### **BLOOD VESSEL TUMOURS OF THE SCALP.**

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MR. ROBERT COOKE, of Bristol, whose name was mentioned in a recent article, "Blood Vessel Tumours of the Scalp", by Professor Lambert Rogers, wishes us to state that the overlapping scalp sutures were first suggested to him by Mr. Percival P. Cole, of London.

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### **THE BRITISH POST-GRADUATE MEDICAL SCHOOL.**

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THE College wishes to draw attention to the announcement of the British Post-Graduate Medical School on page xxx of the advertisements.

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### **NEW DEVELOPMENTS IN SURGICAL EQUIPMENT.**

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THE attention of Fellows is drawn to pages xviii and xxvi among the advertisements, which illustrate some recent developments in surgical equipment. The Editorial Committee is responsible for the selection of the equipment illustrated thereon. The publishers will be pleased, whenever possible, to supply the names and addresses of the manufacturers to anyone requiring such information.

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## **Editorial Notices.**

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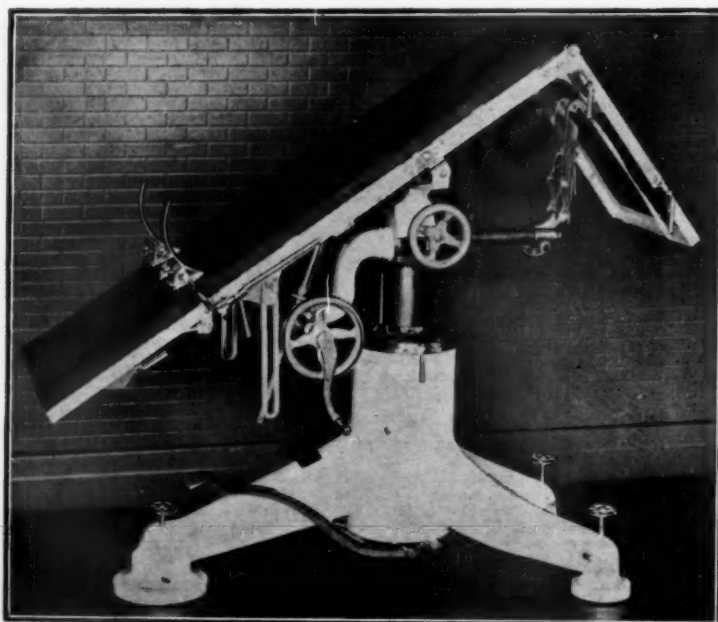
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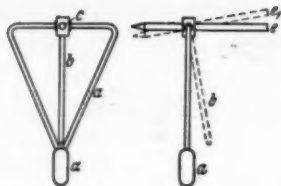
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(*Der Chirurg*, March 15, 1937, page 238.)

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(*Der Chirurg*,  
March 15, 1937,  
page 238.)

A holder for fixing the head in X-ray examinations. It consists of a half-circular bent tube with four pads to make it firm.

(*Acta Chirurgica Scandinavica*, Volume LXXIX, Fasciculi 1 and 2, page 142, December 9, 1936.)

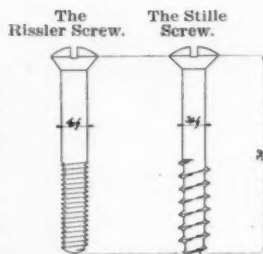
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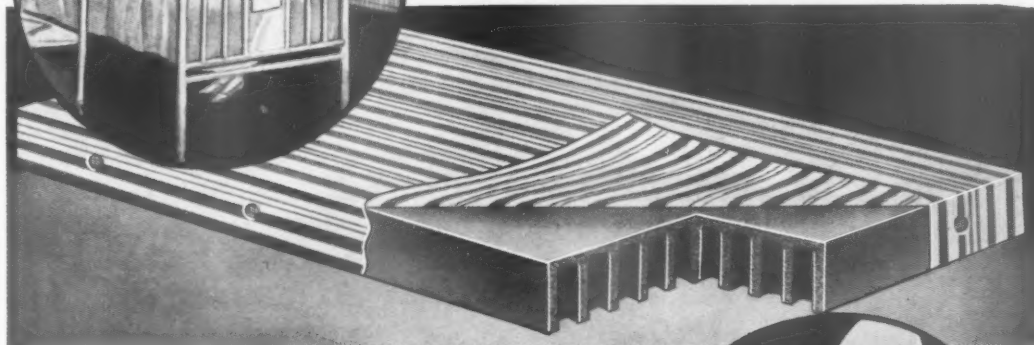


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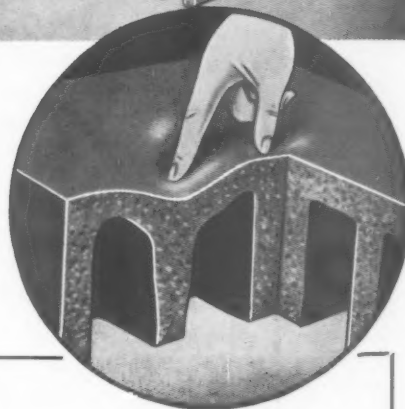
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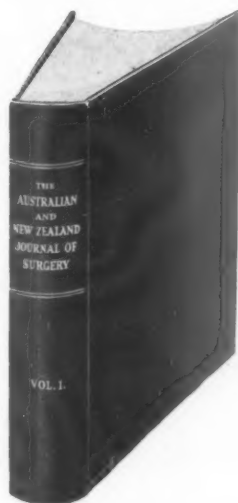
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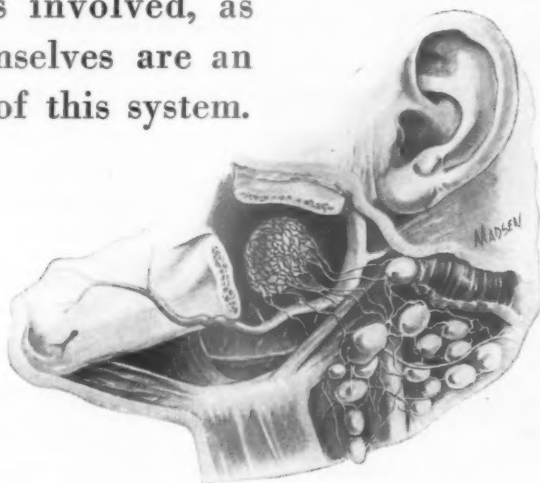
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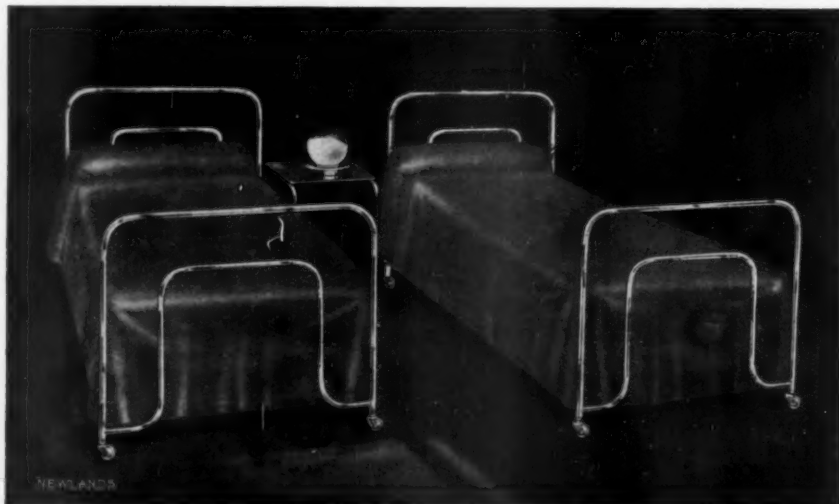
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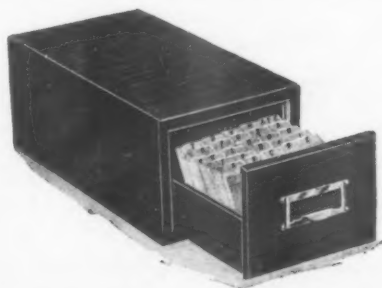
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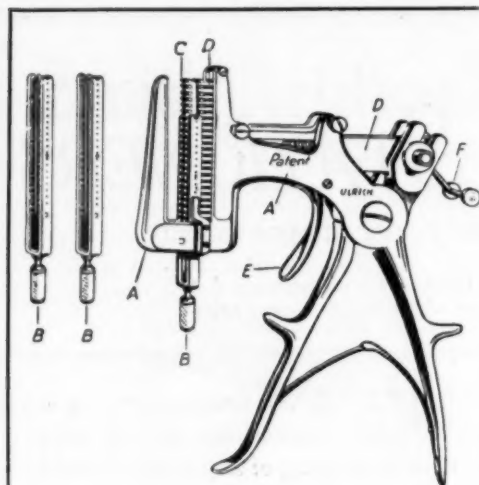
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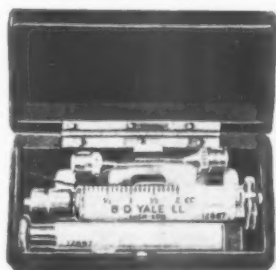
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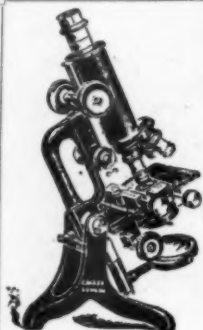
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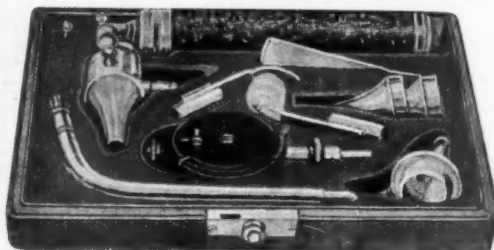


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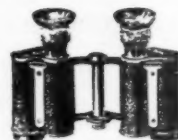
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